

AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Volume 67

Reg. U. S. Pat. Off.

Number 10

NORMAN G. SHIDLE, Directing Editor
 LESLIE PEAT, Managing Editor
 P. M. HELDT, Engineering Editor
 JOSEPH GESCHELIN, Eng. Editor ATHEL F. DENHAM, Field Editor
 GEOFFREY GRIER, Art Editor

Contents

Engineers' New Power Brings Tool Builders Fresh Chances. By Athel F. Denham	287
Just Among Ourselves	289
Citroen Heat Treatments Limited by Extensive Standardization Plan. By Joseph Geschelin	290
New Engine for General Motors Truck. By Athel F. Denham	294
12's and 16's Gain, but 6's Lead Sales	297
Clutch Control, Automatic at Idling, Providing Self-Disengaging Feature, Seen as Possibility. By Athel F. Denham	297
Water Viscosity Being Investigated to Aid Oil Research	298
Production Lines	300
Four-Door Coincidental Lock Designed by Walker	301
Steam Cooling Design Developed by Incorporating Convention Features With Closed Water System. By P. M. Heldt	302
"Shaving" Process Used to Cut Gear-Making Cost. By Athel F. Denham	304
Automotive Oddities. By Pete Keenan	306
News Trailer	306
News of the Industry	307
Calendar of Coming Events	314
New Developments	318
Advertisers' Index	48

Automotive Industries is published every Saturday by
CHILTON CLASS JOURNAL COMPANY
 Chestnut and 56th Streets, Philadelphia, Pa.
 C. A. MUSSelman, President and General Manager
 J. S. HILDRETH, Vice-Pres. and Director of Sales
 W. I. RALPH, Vice-Pres. G. C. BUZZY, Vice-Pres.
 A. H. VAUX, Secretary and Treasurer
 JOHN A. CLEMENTS, Asst. Treasurer
 JULIAN CHASE, Business Manager GEO. D. ROBERTS
 Automotive Industries Advertising Manager
 Cable Address Autoland, Philadelphia
 Telephone Sherwood 1424

OFFICES

New York—U. P. C. Bldg., 239 W. 39th St., Phone Pennsylvania 6-0080
 Chicago—367 West Adams St., Phone Randolph 9448
 Detroit—710 Stephenson Bldg., Phone Madison 2090
 Cleveland—1140 Guardian Bldg., Phone Main 6860
 San Francisco—1045 Sansome St., Phone Douglas 4306
 Los Angeles—Room 651, 1206 Maple St., Phone Westmore 6477
 Portland, Oregon—72 Fifth St.

Controlled by United Business Publishers, Inc., 239 W. 39th St., New York; ANDREW C. PEARSON, Chairman, Board of Directors; FRITZ J. FRANK, President; C. A. MUSSelman, Vice-President; F. C. STEVENS, Treasurer.

SUBSCRIPTION RATES: United States, United States Possessions, and all countries in the Postal Union, \$1.00 per year; Canada and Foreign, \$4.00 per year. Single Copies 25¢.

COPYRIGHT, 1932, CHILTON CLASS JOURNAL COMPANY
 Member of the Audit Bureau of Circulations
 Member Associated Business Papers, Inc.

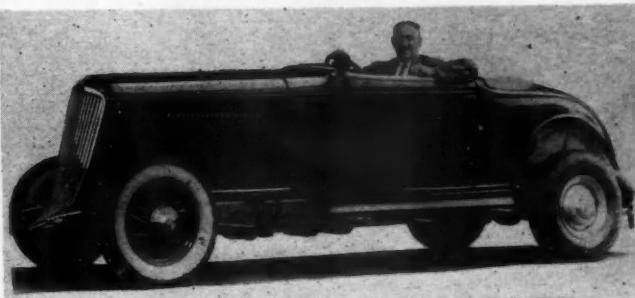
Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Automotive Industries

SPICER • SPICER • SPICER • SPICER

SPICER

Axles and
 Spicer Joints
 Again Help in Establishing
 New Records in Motordom



A new record for the eight-mile climb to the summit of Mount Washington, GORHAM, N. H., known as the most difficult ascent east of the Rockies, has been set by Cannon Ball Baker, driving a Graham eight.

The Mount Washington climb has been a test of motor car power and roadability since the earliest days of motoring.

Salisbury axles and Spicer propeller shafts, manufactured by the Spicer Manufacturing Corporation, contributed to the success of this difficult test and are standard equipment on Graham cars.

Spicer

MANUFACTURING CORPORATION
 TOLEDO, OHIO

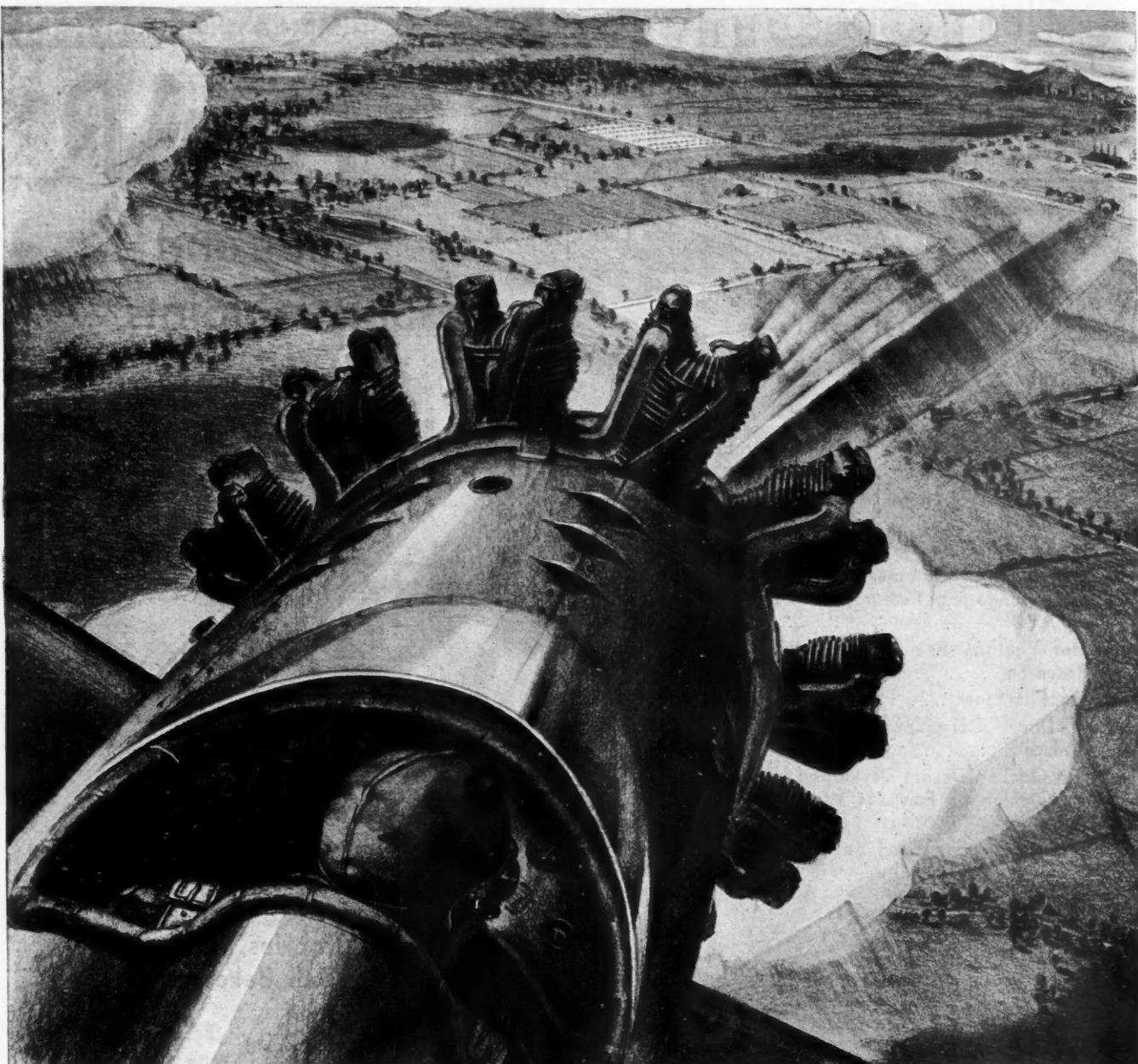
BROWN-LIPE
 CLUTCHES and
 TRANSMISSIONS

SPICER
 UNIVERSAL
 JOINTS

SALISBURY
 FRONT and REAR
 AXLES

PARRY
 FRAMES
 READING, PA.

September 3, 1932



**... hour after hour without a stop
It takes GOOD alloy to meet these tests**

ILLINOIS *alloy* STEEL
ALWAYS DEPENDABLE

By every known care and every known test, Illinois Steel Company controls the uniformity of its alloy steel that the tests of time and use may be met without flaw or failure.



Illinois Steel Company
SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago, Illinois

AUTOMOTIVE INDUSTRIES

Vol. 67, No. 10

• THIRTY-FOURTH YEAR •

September 3, 1932

Engineers' New Power Brings Tool Builders Fresh Chances

Automotive engineers today are studying economic trends as well as design problems. Machine tool builders may well capitalize on this rapidly changing situation



by Athel F. Denham

THE automotive engineer today is rapidly being forced to become a student of economic trends. He is watching what is happening to sales and is trying to find out why. He is studying his own organization to determine the limitations imposed upon him by available production equipment, to find just where more flexibility is needed, where certain facilities give him an opportunity for constructive work. He is delving not only into his own plant but into those

of his parts suppliers and potential suppliers and into those of his company's competitors of tomorrow.

His task looks pretty formidable, but the difficulties are not insurmountable considering the assistance available from his own executive officers in the administrative, sales and production divisions, from the trade press, from parts suppliers, from interchange of ideas in societies and last, but not least, from the machine tool manufacturers.

What Has Gone on Before—

March 12, 1932, issue—It was suggested that machine tool manufacturers, individually or jointly, place in the field ambassadors to the automotive engineering fraternity; men with engineering training who would be the connecting link between design in its more elementary stages and the production equipment required to produce that new design.

The engineer today is placed in a position by circumstances where with the proper background he can take the initiative in his organization.

"To build the kind of a car we have decided to produce," we can hear him addressing his administration, "this is what we have to do. Here is the engineering development which must be undertaken. We will do our design work on a basis of modern production requirements. We will get the continuous cooperation of our production personnel and of qualified machine tool suppliers.

"Where the design of a part or unit may be subject to alterations in design to meet future conditions, the exact character of which we cannot as readily anticipate, we will carry on our work with that idea in mind, by providing greater than usual flexibility both in engineering design and in production equipment. In some cases it is going to mean the replacement of some of our equipment with more so-called standard machine tools, a better name for which would be 'high flexibility' equipment. In some cases it may mean spending proportionally more for direct labor cost than we would have considered desirable a few years ago.

"In any case, this car will not be designed strictly to make use *only* of such facilities as we already have available. Profit possibilities in the modern market lie not in adapting economic conditions to our own facilities, but rather in adapting our facilities to meet today's sales problems."

Does this seem fantastic and visionary? Already evidences that it isn't are beginning to appear. The next few months will bring more. How is the machine tool maker to capitalize on the changing situation? Here is a group of suggestions that has possibilities:

1. Place in the field one or two competent men with the necessary contacts among executives and engineers already established. This man should be recognized by his contacts as being, personally, worthy of trust. He might be responsible either to one manufacturer, or preferably, to several.

2. The special emissary should be placed on a salary rather than a commission. He should distinctly not be a salesman but should be primarily an engineer with a good knowledge of production as a background.

3. Maintain an engineering group or man at each machine tool factory, or cooperatively, for development work.

August 13, 1932, issue—Leading automotive engineers admit frankly that they need help of machine tool manufacturers while new designs are still liquid, so that they may not be hampered by lack of knowledge of detailed production possibilities. Specific quotations cited.

THIS ISSUE—The accompanying article shows how and why the successful automotive engineer has had to broaden the scope of his thinking and action and fills in the details of a program by which machine tool manufacturers may help him in this difficult and pressing task. It's another ACTION story!

4. Carry an advertising campaign to engineering and other executives of customers and prospective customers, stressing the value of confidential cooperation and the ability of the machine tool company or companies to assist both in design and in lowering costs.

5. In each case of contact with new development work have it distinctly understood that the tool products (developmental) are cooperative between the customer and the supplier and these two only. That is, that such developments on the part of the machine tool manufacturer are not to be discussed except perhaps in principle with other machine tool suppliers. Under the new setup this is possible, whereas under the old system it was not.

6. Let the machine tool manufacturer take over virtually 100 per cent of the tooling design work, but bill the customer for it. Today he is handling around 80 per cent of this anyway without, generally, getting anything for it.

7. Capital expenditures are controlled by company executives other than production men. These men must be reached by executives of machine tool manufacturers themselves, as well as through advertising campaigns. The special emissary should be of value in many cases in assisting this contacting process.

8. Retain the conventional staff of salesmen and let them continue to contact production men, etc., as formerly. Impress on them the necessity of keeping confidences either directly from manufacturers or indirectly through the special emissary. Train these salesmen to sell on the basis of reducing costs of the finished product rather than on the basis of individual types of machine tools. In other words, sell performance rather than specifications.

9. Furnish regular salesmen with records of savings effected in plants of customers by the particular machine tool manufacturer. This is a further subject for advertising, but with both copy and sales talk based on the idea of "ability" rather than the product with which the result was achieved.

10. Make salesmen recognize that they should also give attention to retooling of old machines to do better work. Since the action is operative between the machine tool supplier and the customer, such an attitude is essential—it can be paid for by the securing of a greater volume of replacement parts business.

JUST AMONG OURSELVES

What a Couple of Economists Think—

HERE'S how the future of the automobile industry looks to a couple of economists:

"It seems reasonable to expect that the automobile industry of the future will present a picture wherein there are fewer manufacturers, making more standardized cars under the economies of large-scale production, cars which are improved mechanically to appeal to the more rational buying habits of the public, and which are sold through closely supervised dealer organizations.

"Or, to state the same thought more briefly, the automobile industry will have the characteristics of a mature and stabilized business."

The two economists are Cecil E. Frazier, treasurer of Incorporated Investors, and Georges F. Doriot, professor of industrial management, Graduate School of Business Administration, Harvard University. The quotation is the summarizing paragraph of the chapter on "Automobiles," which appears in their recent book, "Analyzing Our Industries," published by McGraw-Hill Book Co.

"No Improvements in Design for 5 Years"

THESE two gentlemen speak frankly, and, in the main, correctly, about the uses and abuses of our industry, but seem

to us to be a bit prone to wishful thinking in some respects, particularly as regards the trend toward what they choose to call "more rational buying habits."

The depression, they believe, has shown the difficulty, when business is at low ebb, in using such sales appeals as "price reductions, real and alleged improvements in performance, economy of operation, riding comfort and safety, and increases in power and speed."

And, what's more, they think these factors never again will be so potent as they have been in the past. "It is not unlikely," they state, "that the depression of 1930 and 1931 will in the future be regarded as the beginning of a trend toward more rational buying habits on the part of the motoring public."

Novelty of Cars Thing of Past

Then, later, they emphasize this point with:

"There is a possibility that the importance of style and style changes as inducements for repeated new-car purchases at short intervals will decline in the future. With the novelty of the automobile largely gone, the general public will tend to minimize the prestige and other intangible factors connected with automotive ownership that have long been the standbys of the salesman and advertiser, and instead will put increasing

importance on service rendered.

"A period of over five years without marked improvement in the operation of automobiles, together with a degree of stabilization of the general features of design, has laid the foundation for this more rational attitude. . . . When the rose-colored glasses are discarded previous extravagances in making frequent trade-ins appear unwarranted, and there is less chance of a repetition to the same extent in future periods of prosperity."

Future Can Be Made by Executives

THIS outlook as regards automobile buying and selling is by no means uncommon among economists today. Many of them have been thinking along similar lines, and the expression of a similar attitude is not hard to find elsewhere. The outlook is distinctly at variance with that of most automotive executives.

Production is Essential Point

If standardization of design grows greater, and if marked improvements are not made in design, some such conditions as these economists picture may easily come about. They may come about anyhow. But it seems likely to us that the prospect of its coming about is exactly what will foster the actual introduction of radically new designs. When that happens all the old factors—coupled with a return to prosperity—may well regain much of their former potency.

Which road the industry takes probably is up to the designers and executives—certainly as much to the latter as the former, because radical designs are no good economically if nobody will permit them to be put into production.—N.G.S.

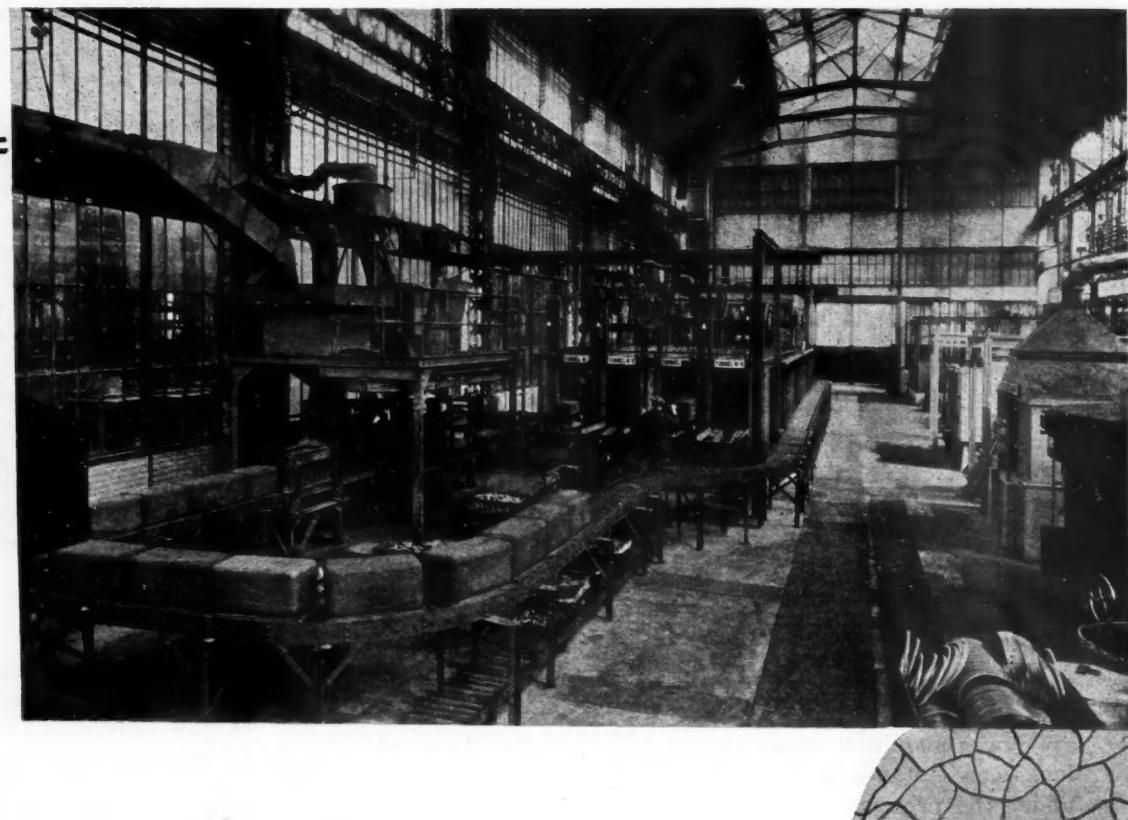


Fig. 1—Completely mechanized case carburing department at Gutenberg. Electric furnaces at the left; electric annealing furnace at the right

Variety of Citroen Steels and Heat Treated by Extensive Standardization

Problem of steel makers simplified by elaborate program specifying alloys and hardening requirements of largest French automotive manufacturing concern

by Joseph Geschelin

BORN of the needs of an infant automotive industry, alloy steel returns the compliment handsomely by providing designers with materials which solve today's problems.

Fortunately for the peace of mind of both metallurgist and steel maker, coordinated standardization has gone on apace. And through the activities of the Iron and Steel division of the S.A.E., the development of new materials and general specifications has grown in a rational and economical manner. That's why alloys of the nobler metals such as nickel, chromium, vanadium, molybdenum, etc., are within the reach of the lowest priced units.

Since the very essence of progress in the automotive industry lies in the free interchange of ideas, we thought that our readers would be interested in comparing their practice with that of one of the foremost European car builders. Thus, through the courtesy of Ch. B. Brull, director of laboratories, Ste. Andre Citroen of France, we have the rare privilege of discussing the specifications and heat treatments

of the steels used in the manufacture of Citroen cars.

For quick reading much of this material is presented in tabular form. Thus, table 1 gives complete chemical specifications; table 2, physical properties; table 3, general heat-treatment procedure.

Glancing over table 1, we have an excellent opportunity of roughly checking against S.A.E. standards. To aid in this we have added a column headed "Nearest S.A.E. number" which proves conformity to a striking degree. In a majority of cases the carbon range is 10 points as is common practice in the United States. In some grades, particularly alloys intended for highly stressed parts, the range is only five points; and in several cases only an upper limit is specified.

Deference to the technical difficulties of steel making is evident from the fact that for practically all grades the chemical analysis is "a titre indicatif," literally, "for information only." Only one grade,

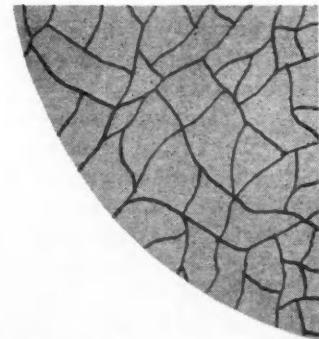


TABLE I

Type of Steel	Chemical Analysis of Citroen Steels							Ends Painted	Nearest* SAE No.	Description
	Carbon	Manganese	Chromium	Other Alloy	Silicon	Phosphorus	Sulfur			
C. 1	0.05-0.15	0.50 max.	.....	.....	0.15 max.	0.05 max.	0.05 max.	Black	1010	{ Low carbon case hardening
X. 2	0.15-0.25	0.75 max.	.....	.....	.....	0.05 max.	0.05 max.	Blue	1020	Medium carbon
C. 3	0.30-0.40	0.75 max.	.....	.....	.....	0.05 max.	0.05 max.	Red	1035	Medium carbon
C. 6	0.60-0.70	0.45-0.65	.....	.....	0.35 max.	0.030 max.	0.035 max.	Mauve	1360	High carbon
K. 8	0.96-1.06	0.25-0.40	1.25-1.55	.....	0.25-0.40	0.030 max.	0.020 max.	Yellow-Blue	52100	.....
K. 8	0.96-1.06	0.25-0.40	1.35-1.55	.....	0.25-0.40	0.030 max.	0.020 max.	Yellow-Blue	52100	Spec. chromium
K. 9	0.65-0.90	0.70 max.	1.50-2.00	.....	.....	0.05 max.	0.05 max.	Yellow-Red	.....	Low carbon
K. 8	0.47-0.52	0.60-0.90	0.85-1.10	Ni.0.25 max.	.....	0.04 max.	0.04 max.	Yellow-Violet	.....	chrome nickel
H. 0	0.13 max.	0.40 max.	0.55-0.75	Ni.2.9-3.3	0.15 max.	0.02 max.	0.02 max.	Red-White	3415	Low carbon CrNi
H. 1	0.15 max.	0.50 max.	0.60-0.80	Ni.2.65-3.0	0.15 max.	0.05 max.	0.05 max.	Red-Black	3415	case hardened
H. 3	0.25-0.30	0.45 max.	0.70-0.90	Ni.3.00-3.60	.....	0.025 max.	0.025 max.	Red-Violet	3325	Medium carbon
H. 4	0.32-0.37	0.60 max.	0.60-0.85	Ni.2.80-3.25	.....	0.04 max.	0.04 max.	Red-Blue	3335	chrome nickel
H. 7	0.30-0.35	0.65 max.	1.50-1.75	Ni.3.5-4.0	.....	0.025 max.	0.025 max.	Red-Green	3335	Medium carbon
L. 8	0.35-0.45	0.40 max.	6-8	.....	2.0 min.	0.05 max.	0.05 max.	Yellow-Black	.....	chrome nickel
O. 2	0.10-0.15	0.30-0.50	0.60-0.90	Ni.2.75-3.25 Mo.0.10-0.30	0.20 max.	.....	0.30 max.	Green-Yellow	.....	Self hardening
E. 0	0.15-0.25	0.60-0.90	.....	.....	.....	0.06 max.	0.08-0.155	White-Yellow	1120	chrome nickel
										{ Spec. Martin screw stock

* See discussion in article. For S.A.E. specifications refer to the S.A.E. Handbook, 1931 edition, 1932 supp.

Treatments Program

Acknowledgment

We are indebted to Mr. P. M. Heldt for his help in translating the Citroen laboratory manuals from the French.

type E.O. is "a titre imparatif," or obligatory. This is a special Martin screw stock of high sulfur content for free cutting properties.

Coming to the physical characteristics, we find the use of the notched-bar or impact test values which are evidently considered of prime importance by the French metallurgist. This factor does not appear in routine specifications in America as metallurgists seem to rely entirely upon the story told by the elongation and reduction in area in judging the toughness of materials.

Chromium and nickel predominate in the alloy

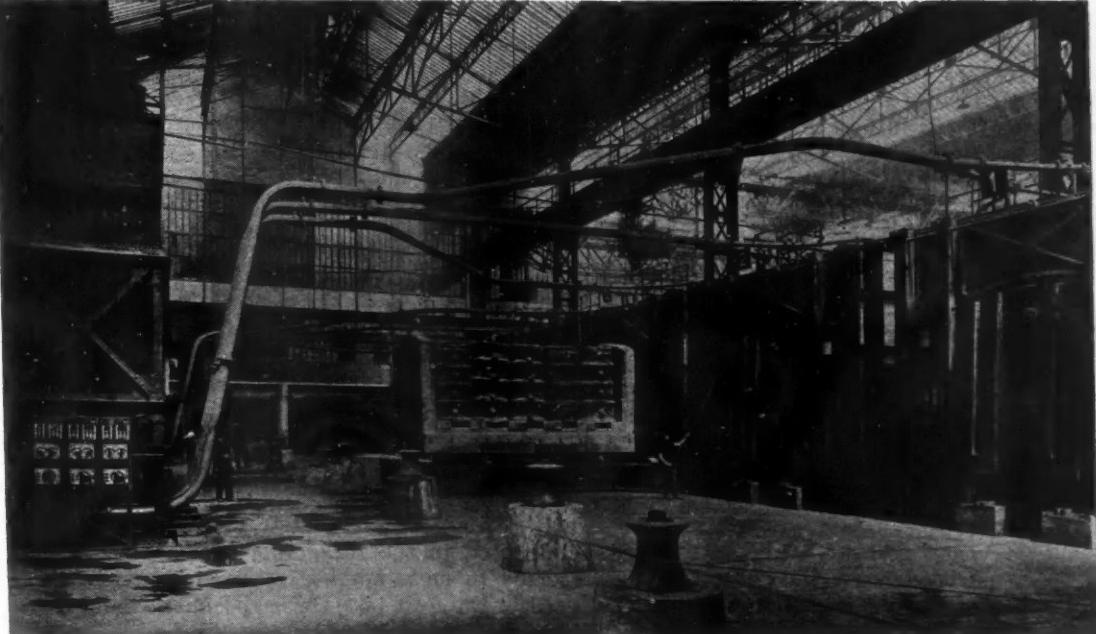
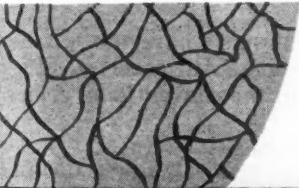


Fig. 2—Tunnel type annealing furnaces for malleable iron castings. Heat is supplied by crude oil or pulverized coal which is delivered to the furnaces through the piping shown at the left

TABLE II

Physical Properties of Citroen Steels							
Type of Steel	Ultimate Tensile lb./sq. in.	Elastic Limit lb./sq. in.	Reduction in area %	Elongation %	Notched Bar Test (Ft.-lb.)	Brinell* Hardness	Typical Use
C. 1	51,000-60,000 max.	28,400 min.	65	28 min.	900	163	
X. 2	64,000-78,000	35,500-45,500	55	25	792	179	
C. 3	82,000-90,000 max.	42,600 min.	55	20	324	217	
C. 6	.....	.....	.....	.....	.....	229	
K. 8	.....	.....	.....	.....	.....	197	
K. 8	.....	.....	.....	.....	.....	207	
K. 9	.....	.....	.....	.....	.....	197-229	
K. 6	.....	.....	.....	.....	.....	534-578	
H. 0	135,000	113,500	.....	7	432	197	
H. 1	71,000	56,800	65	22	900	197	
H. 3	227,000 min.	199,000 min.	40 min.	7.5 min.	193	197-241	
H. 4	106,400 min.	86,560	55	14	432	197-241	
H. 7	106,400 min.	85,200 min.	50	12	432	229	
L. 8	.....	.....	.....	.....	.....	285	
O. 2	142,000 min.	113,600 min.	50	8	288	197	
E. 0	.....	.....	.....	.....	.....	207	

* Brinell hardness measured with 10 mm. ball, 3000 kg. load.

Values of Brinell hardness given for drawn stock "as received," except for steels K. 6 and O. 2; values for the latter apply to heat-treated test specimens.

steels used by Citroen but the percentages used vary considerably from S.A.E. standards.

In indicating the method of steel manufacture, Citroen specifications name the Martin furnace, electric furnace, or crucible.

Although grade L8 is definitely specified for exhaust valves, the supplier may substitute some proprietary analysis. Notice must be given of this and before shipment is made the laboratory tests eight valves—for heat-resisting qualities; tendency to oxidize at high temperatures, and for macrographic study to check the method of forging as well as the method of applying the valve head.

A special rolled silicon strip steel is used for seat-cushion springs, locking springs, vibrator springs for horns, generator clamps, etc. Strip must be delivered "hardened and drawn," free from physical defects, and possessing the following physical properties:

Elastic limit—142,000 lb. per sq. in.
Elongation —7 per cent max.

The strips must be capable of undergoing, without cracking, rolling around a cylindrical bar 0.4 in. diameter, the two ends being brought close together.

As shown in table 1, all grades are identified by color painted on the ends. Today this is a universal practice serving to simplify stockkeeping and minimizing the possibility of errors in utilization.

As a matter of interest the following brief excerpt is quoted from the instructions to suppliers:

Specifications

General Instructions to Suppliers of Steels in Blooms, Billets, Bars, Sheets, etc.

1. Quality of Products

All steels delivered must conform absolutely to the specifications attached hereto and must belong to one of the grades covered in the Specifications.

2. Physical Defects

The products must be free from all physical faults, such as scabs, checks, seams, blow holes, laps, slivers, etc.

Ingots must have been suitably tumbled, and blooms, billets and bars having check marks will always be considered unacceptable.

Bars must be suitably straightened over their whole length. The maximum deviation from straightness permissible is L/1000, where L is the length of the bar. The ends must be cut off squarely and without being chipped. All bars containing defects in excess of our tolerances will be rejected.

3. Markings

Blooms, billets, bars and sheets must always be segregated according to quality and so marked as to obviate getting them mixed up during the operations of unloading and storing.

Moreover, blooms and billets must have the number of the heat painted on both ends. All materials other than sheets must be painted in the conventional colors.

4. Taking of Samples on Delivery

Even where products have been inspected at the plant of the supplier, a series of tests for final acceptance will be carried out in our factories, where the taking of samples will be carried out under the following conditions:

Approximately 2 per cent of the bars, with a minimum of 2 specimens.

One per cent of sheets.

Two specimens 27.5 in. long per 220 lb. of spring steel.

Two specimens from each heat—one, 2 cm. sq. for analysis; one, 15 cm. sq. to be worked into a 1-in. round for tensile tests.

In case a heat exceeds 6600 lb., the number of specimens is increased to 4.

A lot will not be accepted after the first test unless all results are satisfactory. If all results are bad, the lot is rejected; it will also be rejected if the proportion of bad results is not less than two for three specimens, and 50 per cent for more than three specimens.

In cases where the proportion of bad results is less than indicated in the foregoing, a checking test will be resorted to on a number of specimens twice that employed in the first test, these specimens being taken

(Turn to page 316, please)

Citroen Heat Treatment Processes Show Wide Scope of Standardization

TABLE III
Routine Heat Treatment Procedure

Treatment	Materials	Description of Operations
A	Steels C3, X2, H1, H0, H4, H7.	1. Heat slowly up to 1560 deg. F. 2. Maintain the parts at this temperature for at least 25 min., taking precautions to prevent their oxidation. 3. Let the parts cool outside the furnace, seeing to it that they are not placed in a fresh current of air or placed in piles, which latter would result in too slow cooling and in a poor grain structure of the metal. Exception should be made of parts made of H7 steel, which must be allowed to cool in a closed box.

A1 Steel C1 In this case the heating temperature is carried to 1605 deg. F. Operations 2 and 3 are identical with those similarly numbered above.

A2 Gray Iron In order to render parts of gray iron more nearly homogeneous, and to soften them, the annealing time is increased to one-and-one-half or two hours.

A3 Aluminum To render parts of aluminum-copper alloys, such as pistons, connecting rods, etc., more nearly homogeneous, the anneal is carried out at a temperature of 750 deg. F. during a period of 45 minutes.

Operation B
For Steels
C3, H1, H0

- Heat the parts slowly up to a temperature of 1560 deg. F. For steel H4 this maximum temperature should be lowered to 1470 deg.
- Hold the parts at this temperature for at least 25 minutes, making provision to prevent oxidation.
- Withdraw the parts from the furnace sufficiently slowly so their temperature drops at least 45 deg. F. (an exception should be made of steel H4).

4. Quench in pure water of a maximum temperature of 77 deg. F. Quench the parts in either pure water or oil at a maximum temperature of 77 deg.

5. As far as possible, withdraw the parts from the water or oil bath when they are at a temperature of 140-212 deg. F., in order to remove the quenching stresses.

6. Draw the parts at between 1110 and 1200 deg. F. by keeping them for at least 25 minutes at this temperature (in order to equalize the grain structure as much as possible).

7. Let cool in still air. Note: Any parts showing signs of having been overheated or of being work-hard are subjected to treatment A before this treatment.

Operation D
Operation E

- Heat the parts slowly up to a temperature of 1470 deg. F.
- Keep the parts at this temperature for at least 25 minutes, taking precautions to prevent their oxidation.

3. Remove the parts from the furnace and quench them in a bath of clean oil at a temperature not exceeding 86 deg. F.

4. As far as possible, withdraw the parts from the oil baths when they are at a temperature of between 140-212 deg. F., to remove stresses due to the quench.

5. Draw the parts between 392 and 525 deg. F., by letting them remain at this temperature for 20 minutes, in order to remove stresses due to the quench.

7. Let cool in still air. Note: All parts of this class are previously given treatment A, in order to remove traces of overheating or of work-hardness.

Operation C
For Steels
C3, H1, H4, H0

Description of Operations

- Heat the parts slowly up to a temperature of 1560 deg. F. For steel H4 this maximum temperature should be lowered to 1470 deg.
- Hold the parts at this temperature for at least 25 minutes, making provision to prevent oxidation.
- Withdraw the parts from the furnace sufficiently slowly so their temperature drops at least 45 deg. F. (an exception should be made of steel H4).

4. Quench the parts in either pure water or oil at a maximum temperature of 77 deg.

5. As far as possible, withdraw the parts from the water or oil bath when they are at a temperature of 140-212 deg. F., in order to remove the quenching stresses.

6. Draw the parts at between 930 and 1020 deg. F. by keeping them at that temperature for at least 25 minutes for steels C3, H1 and H0, and at least 40 minutes for steels of the H4 type (in order that the structure may become quite homogeneous).

Let cool in air.

Note: Any parts showing signs of having been overheated or of being work-hard are subjected to treatment A before this treatment.

- Operation F**
- Heat slowly up to the temperature of 1560 deg. F.
 - Keep the parts at this temperature for at least 25 minutes, taking care to prevent oxidation.
 - Expose the parts to the free air, for the quench.

- Reheat the parts for about 30 minutes at between 390 and 345 deg. F. to remove hardening stresses.
- Let cool in still air.

Note: These parts are given treatment A whenever they have been hot-forged in any manner.

- Operation H**
- Heat slowly up to the temperature of 1560 deg. F.
 - Keep the parts at this temperature for at least 25 minutes, taking care to prevent oxidation.
 - Expose the parts to the free air, for the quench.

Withdraw the parts from the furnace sufficiently slowly so that their temperature drops about 45 deg. Quench the parts in oil at 77 deg. or, preferably, in water at 77 deg. F.

As far as possible, withdraw the parts from the oil or the water when they are at a temperature of between 140 and 212 deg. F.

Draw the parts at between 390 and 480 deg., keeping them at this temperature for at least 30 minutes, to remove hardening stresses.

Let parts cool in still air.

Operation G
Carburization followed by { T₁ for refinement of grain
Quench { T₂ for case-hardening

Steels C1, H1, and H0 are regularly subjected to this treatment; steels C3 and X2 under certain conditions.

After the portions of the surface which are not to be hardened have been protected, the parts are placed in boxes containing a carburizing compound composed of 60 per cent powdered wood charcoal and 40 per cent barium carbonate, which is regenerated and maintained at this composition after each operation. The layer of carburizing material around each part must be not less than 13/16 in. thick. These boxes, which are hermetically closed, are provided with a cylindrical specimen of not less than 3/8 in. diameter of steel of the same grade as that of which the parts are made. They are raised to a maximum temperature of 1700 deg. F. for steel C1 and 1610 deg. for steels H1 and H0. They are held at this temperature for a time varying with the thickness of case indicated on the drawing by a symbol. The boxes are cooled slowly and then emptied, and the parts, after being freed of carburizing material which may adhere to them, are subjected as a rule to two quenches.

Heat Treatment T₁—The parts are reheated to between 1650 and 1695 deg. F. (the quenching temperature of steels H1 and H0 should be lower than that of steel C1), then quenched in water at a maximum temperature of 77 deg. F.

T₂ Case-Hardening Quench—The parts are again reheated to 1425-1490 deg. F., according to their dimensions, and quenched in water at a maximum temperature of 77 deg. F. Parts which have a large carburized surface are then subjected to a draw at between 390 and 480 deg. F. for about 30 minutes, to completely remove the hardening stresses.

Operation L
I—Normalizing Quench

- Heat slowly to 1650 deg. F.
- Keep the parts at this temperature for 25 minutes, taking care to prevent oxidation.
- Withdraw the parts from the furnace sufficiently slowly so that their temperature drops about 45 deg.
- Quench the parts in water for the H0 steel and in oil for the H4 steel, the quenching liquids being at a maximum temperature of 77 deg. F.
- If possible, withdraw the parts from the water or oil when they are between 140 and 212 deg.

II—Strengthening Quench
Repeat the above operations, but heat to 1560 deg. and quench at this temperature in water for steel H0, and in oil for steel H4.

- Draw the parts at between 930 and 1020 deg. F. by keeping them at this temperature for 25 minutes for steel H0, and 40 minutes for steel H4, in order to obtain a homogeneous structure.
- Let cool in air.

Operation M

Heat to 1700 deg.

Keep the parts at this temperature for 25 minutes, taking care to prevent oxidation.

Withdraw the parts from the furnace and quench them in clean water at not over 86 deg. F.

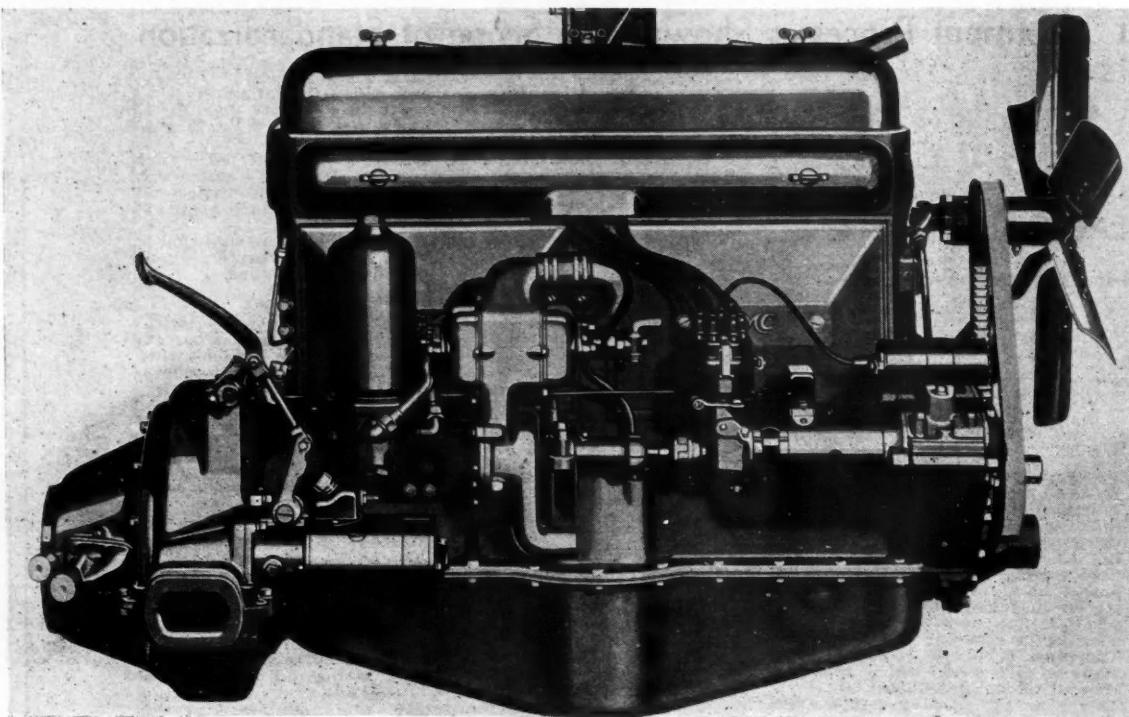
Heat to 1650 deg. F.

Keep the parts at this temperature for at least 25 minutes, taking care to prevent their oxidation.

Let the parts cool outside the furnace, taking care not to place them in a current of air or in a pile, which would result in irregular cooling.

New E Line S

by
Athel F.
Denham



Right side view of the new GMT "400" engine, showing the oil filter at the left, temperature regulator in the center, the downdraft carburetor, and the type of rubber engine mountings used

FOR its three major basic models in the 5 to 7½-ton field, the T-61, the T-83, and the six-wheel T-90, General Motors Truck Co. has developed a new engine, of 400.9 cu. in. of piston displacement, with a torque curve which shows 296 lb. ft. or better everywhere from 800 to 1600 r.p.m. It is known as the "400."

While there are other developments in these three truck lines, it is the engine which is of foremost importance. A check of COMMERCIAL CAR JOURNAL's specification tables reveals that there is not another six-cylinder engine within 50 cu. in. of its piston displacement that develops an equal or better torque peak. Nor is there an eight-cylinder engine within 20 cu. in. for equal or better torque.

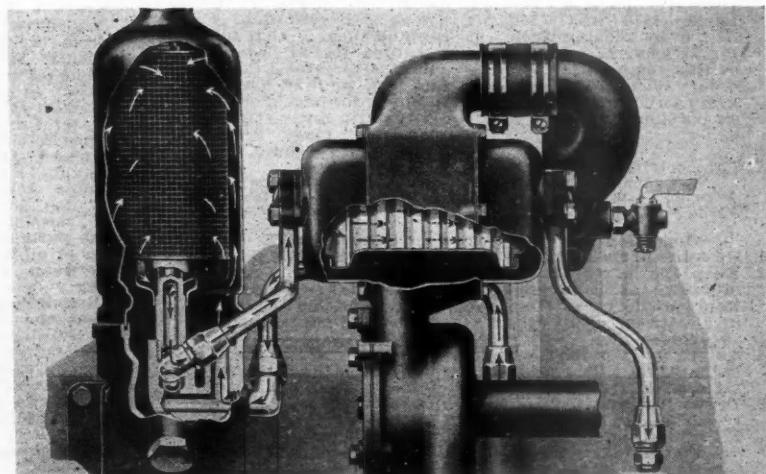
This is of the valve-in-head type, with a bore and stroke of $4\frac{1}{8} \times 5$ in. for its six cylinders, and is governed at 2300 r.p.m., at which speed it develops 110 hp., it is claimed. Actual peak horsepower is 112.5 at 2800 r.p.m.

In detail design the engine is ultra-modern in every respect and yet not radical. There are stellite-faced valve inserts screwed into a nickel-iron cylinder head, for long valve life and reduction in frequency of valve grinds, etc. There is a fully counterweighted crankshaft, equipped with a harmonic balancer. There are new type pistons of aluminum alloy for faster heat dissipation, and with the piston pin retained by aluminum keepers staked in the ends of the bosses.

Exhaust valves have tulip-shaped heads of aircraft engine design practice for greater heat conductivity and less distortion. Intake valve openings have been given a "venturi" shape for increased mixture flow into the cylinder.

Manifolds are of three-piece design, with packless slip-joints, for expansion without distortion of the cylinder block or injuring gaskets. The entire engine is pressure-lubricated, including the rocker-arm shaft bearings, and piston-pin bearings through drilled connecting rods.

In the lubrication system, moreover, are to be



Cutaway view of oil filter and oil temperature regulator, showing direction of oil flow. Both units have by-pass valve protectors against excessive oil pressure

Engine for General Motors Trucks Shows Exceptional Torque Ability

"400" develops more power than any six or eight-cylinder powerplant within 20 cu. in. of its capacity, check-up shows

found a cleanable type oil filter, located in the line between the pump and main bearings, and an oil temperature regulator, just beyond the filter, so that all oil going to main bearings is first cleaned and then cooled, if too hot, or heated, if too cool—automatically—before reaching the bearings. Longer bearing life is thereby assured. Further, there is a well-laid-out crankcase ventilating system, with an intake to catch the blast from the fan, to prevent oil dilution and acid formation.

Down-draft carburetors of Stromberg DX-3 plain-tube type are provided, with accelerating pumps, semi-automatic choke valves and economizers, etc. Fuel feed is by pump, mechanically operated; there is a Triplex air cleaner, a non-jamming starting motor engagement, and three-point, rubber-insulated en-

gine suspension for engine protection from road shocks or frame twist.

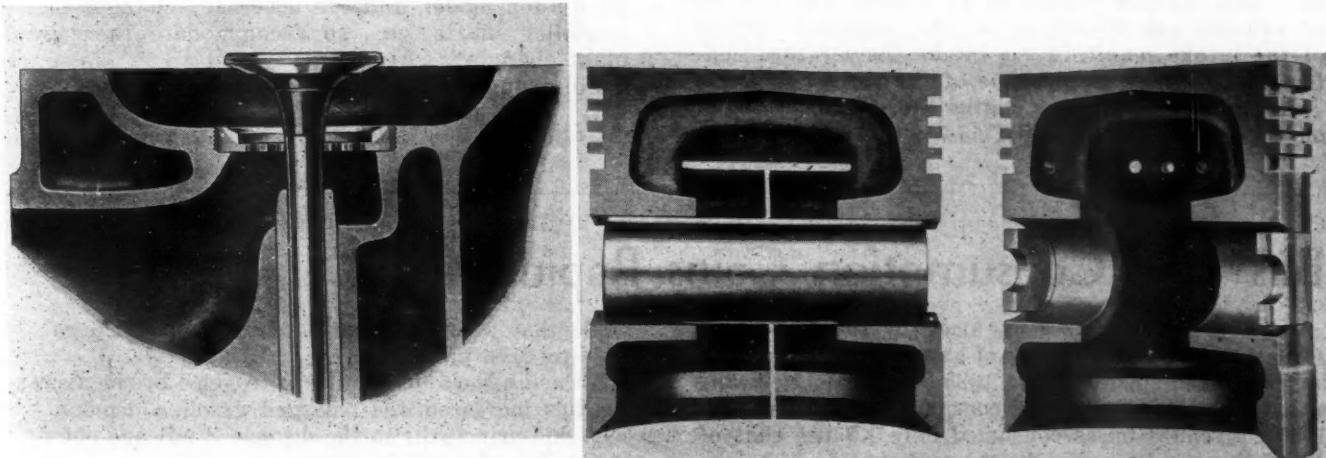
These are some of the highlights of this interesting engine, which in outward appearance bears a resemblance to the former 331 series. As a matter of fact the 331 engines, which have a maximum torque of 230 lb. ft., and develop 94 hp. at 2500 r.p.m., are still available in the three trucks mentioned, at a reduced cost for the whole unit.

Accompanying specifications give a further idea of the detail design. In general this follows the practice of the 331 engine.

In addition to the story which the specifications tell, some additional points might be brought out. The lubrication system and the manner in which it is protected and provides protection is particularly interesting.

From the oil pump oil goes directly to the large-capacity filter. There is a by-pass check valve in the base of this unit for protection against clogging of the filter, or for partial by-passing of the oil when cold.

From the filter the oil goes to the temperature regulator. This is of Harrison manufacture, and is well known in the passenger car field. It consists of a cartridge-type core similar to a water radiator. It is mounted in an extension of the water pump body, and is interposed between the water pump and the cylinder block. This regulator performs the dual purpose of water-cooling the oil when hot, under high-speed driving conditions, and of heating



Insuring increased mileage between valve grinds, and reduction of seat pounding, are the stellite-faced valve inserts for exhaust valves. They are screwed in the block and then peened at four points on top

The new aluminum alloy pistons used in the GMT "400" engine. Note the piston pin retaining keepers. The T-slot for skirt expansion is full length, from bottom of skirt to oil groove

the oil when cold by transferring heat from the warmer radiator water to the colder oil.

For protection against injury due to too high a pressure when the oil is cold, a spring-loaded, steel-ball valve is provided, allowing some of the oil to be by-passed directly to the bearings.

From the pump distributing lines carry oil to main bearings, and through drilled crankshaft to connecting rods. Drilled passages in connecting rods provide pressure lubrication to piston pins. Camshaft bearings, cylinder walls, pistons, and valve tappets are lubricated by oil thrown from ends of main and connecting rod bearings.

A secondary line forces oil to the pressure gage and tubular rocker arm shaft, through drilled holes in the shaft to rocker arm bearings, and through drilled holes in these to push rod ball joints, running down from there to lubricate valve guides, rollers, pins, etc.

The greater portion of oil from the rocker shaft is carried down the front end of the engine to timing gear housing, lubricating the timing gears, front camshaft bearing, and generator front bearing.

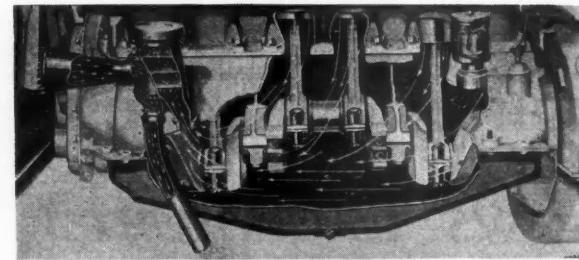
Additional protection is furnished by the crankcase ventilator. This unit, integral with the oil filler tube, functions on the ejector principle. A funnel attached to the front side of the oil filler collects draft of air from the fan, directs it down through the ventilator tube, creating a suction at the opening in side of the oil filler tube, which draws water and fuel vapors from the crankcase and ejects them from the outlet end of the ventilator tube extending down below the engine side pan.

Fresh air replaces vapor in the crankcase through an air cleaner breather on the left rear side of the crankcase.

On the carburetor the accelerating pump is actuated by manifold vacuum when the throttle is suddenly opened. It meters a definite charge, which delivers over a period of time. Idle and low-speed jets are located below the throttle, with separate idle adjustment. An economizer is provided. A bypass metering jet enriches the fuel for wide-open throttle conditions, this flow occurring only when the economizer needle valve is open, the valve being operated in conjunction with the accelerating pump.

An adjustable plate valve is inserted between intake and exhaust manifolds to control the amount of exhaust gas impinging on the vaporizer section of the intake manifold for intake temperature control. The intake manifold is of the three-port type.

In addition to the new engine there is to be found on the trucks in the G.M.T. 5-7½-ton range a five-



In the G.M.T. crankcase ventilating system fan blast is used, but air is not blown into the crankcase. The passage of the air blast sucks vapors out of the crankcase. Note the counterweighted crankshaft also and the screened crankcase breather at the right

speed transmission as standard equipment. This transmission was formerly offered as extra equipment. The standard model is of the under-drive type, with direct drive in high. An over-drive edition is available at no extra cost, having direct drive in fourth speed and a ratio of 0.80 to 1 in fifth.

Main and countershaft bearings, with exception of front mainshaft, are of the ball type. The latter is a roller.

The transmission mounting is semi-amidships, with three points of support, the front mounting being a large, spherical joint on clutch housing, while at the rear the case is bolted at two points to a frame cross-member. It is stated that the transmission is free to move fore and aft, in addition to swiveling in all directions. Oil capacity is 7 qt.

Following are transmission ratios:

	Underdrive	Overdrive
Low	8.22	6.55
Second	5.75	4.58
Third	3.78	1.97
Fourth	1.91	direct
Fifth	direct	0.80
Low reverse	10.11	8.05
High reverse	5.15	...

Other changes in the trucks consist of an increase in the gross vehicle ratings, due to the engine increase, the adoption of larger radiators, with more tubes to take care of the higher power output, the adoption of the same type of clutch used in the G.M.T. 85, 6-8-ton model, and the necessary changes in the propeller shafts, etc., to accommodate the power-plant changes.

Following are the new gross vehicle ratings:

T-61...22,000 lb. T-83...25,000 lb. T-90...28,000 lb (6-wheel)
5-6½ ton 5-7½ ton 5-7½ ton

Bus Fuel Consumption Gains Rapidly

ACCORDING to a survey made by the Bureau of Mines, the consumption of gasoline by motor buses has increased steadily since 1925, both absolutely and as a proportion of the total consumption. Whereas in 1925 "revenue" buses consumed only 1.5 per cent of all of the gasoline used in this country, in 1931 the percentage had increased to 3.

The increased gasoline demand results largely from the gain in motor fuel consumption per bus rather than from an increase in the number of buses operated. The average gasoline consumption by intercity buses increased from 6061 gal. in 1924 to 11,585 gal. in 1931,

while that of city buses increased from 6616 gal. in 1924 to 9176 gal. in 1931.

Although the annual mileage traveled by the average bus has increased, the enlarged gasoline demand has been due principally to the decreased mileage obtained per gallon of gasoline consumed. The use of larger buses is a major factor in the increased gasoline consumption per bus-mile.

The monthly gasoline demand by the city bus does not vary as widely as that of the intercity bus. The use of the intercity bus for vacation travel contributes to the increased summer demand for gasoline.

12's and 16's Gain, But 6's Lead Sales

Ford Eight largest seller during first half, although in production only two of the six months

Eights constitute largest group in U. S. passenger car roster, analysis shows

EVEN though the Ford Eight was available in quantity only during the last two months of the first half, it was the largest selling eight-cylinder car during that six months' period.

Its addition to this field made the eight-cylinder cars show up relatively better with an 18 per cent loss from the first half of 1931 than either the four or six-cylinder groups.

Leaving the Ford Eight out of this year's figures, the eight-cylinder group lost about 39 per cent and hence made a better comparative showing than either the sixes or eights.

The addition of Auburn, Franklin, Lincoln, Packard and Pierce-Arrow to the 12 and 16-cylinder field combined to give this group a gain over last year of 45 per cent.

Sales Rankings in First Half of 1932

Fours	Sixes	Eights	12's and 16's
Ford	Chevrolet	Ford	Cadillac
Plymouth	Pontiac	Buick	Lincoln
	DeSoto	Nash	Auburn
	Essex	Studebaker	Packard
	Dodge	Packard	Pierce-Arrow
	Oldsmobile	Hudson	Franklin
	Willys	Auburn	
	Chrysler	Graham	
	Studebaker	Chrysler	
	Rockne	Pontiac	
	Nash	Dodge	
	Hupp	Hupmobile	
	Willys-Knight	Oldsmobile	
	Graham	LaSalle	
	Reo	Pierce-Arrow	
	Franklin	Cadillac	
	Durant	Lincoln	
	DeVaux	Marmon	
		Reo	
		Willys	
		Cord	

Registrations of New Passenger Cars Classified According to Number of Cylinders

	First Six Months 1931	1932	Per Cent Change
Fours	372,710	139,113	-63
Sixes	619,061	369,963	-40
Eights	181,296	149,205	-18
12's and 16's	2,718	3,952	+45
Unclassified	1,335	1,392	..
Total	1,177,120	663,625	-44

Clutch Control, Automatic at Idling, Providing Self Disengaging Feature, Seen as Possibility

ASUBJECT of rather general interest: What's going to happen to free wheeling next year? A year ago about half the engineers in the industry gave free wheeling twelve months. As the industry is preparing for its 1933 offerings the old arguments pro and con are coming up again. Now, however, there is some additional light. It does seem to be fairly generally conceded that the public likes the idea of free wheeling insofar as it reduces the number of operations required in shifting gears. In that respect there is a definite similarity between mechanical free-wheeling devices and automatic clutches, with the advantage somewhat in favor of the latter, provided good synchronizers are used in the transmission.

If it were to be accepted, however, that the public

likes the more easily accomplished change of transmission ratio (including whatever is necessary to do with the clutch pedal), and does not, on the other hand, generally care for or want the coasting feature, there would still be an option left. Peculiarly enough no one has tried it yet, in spite of the fact that it involves no great difficulties in installation.

If it is desired to eliminate the use of the clutch pedal without introducing "coasting," the obvious thing would be to tie an automatic clutch control up with the gearshift lever. In other words, we might have a clutch control which is automatic at idling speeds, and in addition also disengages automatically whenever gears are shifted. A rocking ball on the shift lever and an electrical contact incorporated therein would do the trick.—A.F.D.

Water Viscosity Being Investigated Further To Aid Oils Research

CONSIDERABLE research work on the properties of different lubricants is being done at the Bureau of Standards, which institution is cooperating with several technical and industrial organizations, such as the Society of Automotive Engineers and the American Petroleum Institute.

Undoubtedly the most important property of lubricating oil is its viscosity under the conditions of use. As in the case of all other fluids, the viscosity of a lubricating oil is not a definite fixed value but varies with the temperature and pressure. Since these conditions cannot be held constant in bearings, it is desirable to know what might be called the viscosity characteristic of the oil, that is, the variation of the viscosity with temperature and pressure. Each grade of lubricant, of course, has its own distinct viscosity characteristic. That the viscosity is the most important quality of a lubricating oil is borne out by the recent discovery that even in the region of thin-film or boundary lubrication the friction coefficient is dependent upon the viscosity of the lubricant. That this relation holds for the condition of complete-film lubrication has been known for a long time.

The viscosity of lubricants is determined by means of a viscosimeter, of which class of instrument there are several distinct types, based on different principles. The most widely used is the efflux type, of which the Saybolt and Engler are the most prominent examples.

Where it is desired to base calculations of frictional losses on the viscosity, another characteristic, known as the absolute viscosity, is worked with. The unit corresponding to this property is defined as the force required to move a unit area of plane surface at unit speed over another plane surface from which it is separated by a layer of lubricant of unit thickness. This unit, which is known as the poise (after Poiseuille, a French scientist), has been found rather large for practical purposes, and it has become customary to express viscosities in centipoises, a unit one-hundredth as large.

In addition to the two conceptions of viscosity already referred to, there is a third one, known as the kinematic viscosity, the units of which are the stokes and centistokes. The kinematic viscosity is defined as the quotient obtained by dividing the absolute viscosity by the specific gravity of the liquid.

Viscosimeters must be calibrated by passing through them a liquid of known viscosity characteristics. The liquid ordinarily used for this purpose is water. In the research program of the Bureau of Standards a high degree of accuracy is aimed at, and it is felt that the viscosity characteristics of water are not sufficiently well known. A new determination of these characteristics therefore has been decided upon, and it is hoped

to reduce the limit of error, which at present is believed to be of the order of plus or minus 0.5 per cent, to less than plus or minus 0.1 per cent.

In making the new determination of the viscosity of water, a method will be employed which is in a sense the direct opposite of that used in practically all previous determinations. It has been customary to cause a given volume of liquid to flow through a capillary orifice under a known pressure and to note the time required for its efflux. By the new method, the liquid will be caused to flow through the capillary at a known rate, and the difference between the pressures at the inlet to and the outlet from the capillary will be measured.

Viscosities are generally regarded as inversely proportional to the rates of flow of fluids through standard orifices under a standard head, or directly proportional to the time required for a certain quantity to flow through the orifice. This assumption is based on the law of streamline flow in capillaries. One of the factors in the equation for rate of flow through capillary passages is the length of the passage, or, rather, the length over which streamline flow continues. Now, it is obvious that there is no abrupt change from streamline to turbulent flow at the exit from the capillary passage, nor the reverse change exactly at the entrance to the passage. This deviation from theoretical conditions is taken care of by making an allowance for "end effects." Unfortunately, the matter is complicated by the fact that this "end effect" is not constant for a capillary passage of given design, but varies with the viscosity of the liquid.

Owing to the existence of this end effect, viscosities are not absolutely proportional to the times of efflux of a given quantity under a definite head, and a correction factor must be applied to the results of observation. Variations from direct proportionality naturally are greatest if liquids are compared whose viscosities are widely different, and to minimize errors in such comparisons it is now proposed to establish a number





Research men from automotive plants, fuel concerns and the Bureau of Standards recently met at Uniontown, Pa., and carried out road tests. The group:

Left to right: L. B. Voshall, Texas Co.; J. M. Campbell, G. M. Research; J. R. Sabina (seated), Atlantic Refining Co.; E. Dunning (standing), Shell Petroleum Corp.; Gilbert Way, Chrysler Corp.; Cleveland Walcutt, Ethyl Gasoline Corp.; J. G. Cook, Texas Co.; A. L. Clayden (standing), Sun Oil Co.; C. B. Veal, S. A. E.; W. Anderson, Chrysler Corp.; W. M. Holaday (back), Standard Oil Co. (Ind.); B. W. Dickinson, U. S. Bureau of Standards; C. B. Kass, Standard Oil Development Co.; H. W. Best, Yale University; G. A. Hope, Standard Oil Co. of N. Y.; A. W. Pope, Waukesha Motor Co.; J. C. Burk, Vacuum Oil Co.

of intermediate standards in addition to the water standard.

Some of the difficulties involved in work of this kind will be appreciated when it is mentioned that in making viscosity tests of water and similar fluids, capillaries of a diameter of 0.020 in. are used, and these must be produced within very close limits on the average bore and with a minimum of conicality and ellipticity. It seems impossible to attain this high degree of accuracy by the usual tube drawing process, and for this reason a special process has been evolved whereby the capillary passage will be produced by lapping, and measured microscopically after it has been filled with mercury.

Importance is lent to the fundamental work on viscosity measurements by the recent discovery that frictional losses in journal bearings are dependent upon the viscosity of the lubricant throughout the whole range of lubricating conditions. While in the region of complete-film lubrication the frictional losses increase with the viscosity, in the region of thin-film lubrication frictional loss and viscosity of lubricant are inversely proportional.

It has been found that a journal type of friction machine is not well adapted for investigations in the region of thin-film lubrication, and for this reason a modification of the Herschell flat-plate friction machine has been adopted, by means of which it is planned to explore the entire region extending from the minimum point of the "friction coefficient vs. (viscosity X speed of revolution/unit pressure)" curve to the point of static friction.

It seems rather surprising at first glance that in the region of thin-film lubrication the coefficient of friction decreases as the viscosity of the oil increases, but on further consideration the reason for this becomes plain, because in this region there is a certain intermeshing of asperities on the surfaces of the journal and the bearing, and for the same values of rotative speed and load, this intermeshing—which is the cause of addi-

tional friction—is evidently less the higher the viscosity of the lubricant.

The above-mentioned investigations constitute what may be called the theoretical or fundamental side of the research program. The more practical side covers experiments with different types of commercial lubricants in frictional testing machines, with a view to determining the maximum unit loads these lubricants will sustain. The following will be investigated.

Straight mineral oil
Mineral oil blended with lard oil
Mineral oil containing chloride of sulphur
Lead-soap oil practically free from sulphur
Lead-soap oil of commercial type
Lead-soap oil containing corrosive sulphur
Mineral oil containing sulphur.

It appears that the work done to date relates mainly to the formulation of the test procedure. Three different friction-testing machines, the General Motors large machine, the Timken, and the Floyd, have been secured for the tests. A fourth machine, the General Motors small type, probably will also be made available.

One of the conclusions arrived at in the formulation of the test procedure is that stepwise increase in the load on the bearing would give results that would be of little practical value, and in some of the preliminary tests the load was increased gradually at a definite rate until the bearing seized. The tests, it is understood, will cover the variation of the friction coefficient with speed and load throughout the whole range up to the seizing point, and it is to be expected that when the program is completed we will have definite information regarding the behavior to be expected from all of the types of lubricants listed above, including several of the so-called extreme pressure lubricants, for which there is an urgent need in this era of high speeds and intense loads.



Courtesy, Monarch Machine Tool Co.

PRODUCTION LINES

Better But Cheaper

Can the cost of wire products be brought down without affecting quality? The answer is yes, according to technical bulletin No. 339, issued by the W. S. Rockwell Co., furnace engineers. The solution seems to lie in better methods of heating and cooling. This means uniform exposure as well as control of time and temperature—in cooling as well as heating. The bulletin shows a large number of heating and annealing furnaces. The principle applies with equal success to many other kinds of heat-treated products.

From the Ranks

Some of the largest manufacturing concerns in the country believe in the efficacy of suggestion systems

for improving the product and cutting costs. Because of the general interest in this feature of management, the Metropolitan Life Insurance Co. has just published a digest of the suggestion systems of over one hundred companies. The report describes how such systems have been set up, their salient features and how they function. It may be well worth your while to get a copy of "Employees' Suggestion Systems."

Means Uniformity

For uniformity of heat treatment of small parts such as bolts, nuts, gears, pinions, etc., Westinghouse recommends their electric belt furnace. Brief details of the unit and its applications are found in a leaflet, pub. L.20543.

Machine Tool & Equipment Show

October 15 is the date for the annual Production and Factory Equipment Issue of *Automotive Industries*.

For more than a year automotive manufacturing executives have been working hard to solve this riddle:

"How can lower-priced quality products be produced at a profit?"

With so much attention focused upon this problem, the editorial staff of *Automotive Industries* is plan-

ning another "Machine Tool and Factory Equipment Show."

The "exhibits" are being carefully selected.

The "space" allotted to each will be brief, but will include all of the essential features.

The whole will be compressed, bound and delivered to the machine tool and equipment buyers in the automotive industry as a part of the 1932 PRODUCTION AND FACTORY EQUIPMENT ISSUE of *Automotive Industries*.

Watch for it.

How Much

Industrial Standardization for August tells of a project before the ASA to study methods of test and requirements of non-shatterable glass. Reason? Because several states, notably Massachusetts, have set their own. The National Bureau of Casualty and Surety Underwriters thinks it is none too early to get some unanimity into the thing.

Cool Off

Welding tips perform better and last longer when properly cooled. Not only that, but the safety of welds is more sure because the water-cooled holder keeps its shape longer. Trouble is that many people are lulled into a feeling of security because they see water leads to the tips. It's only in few cases, however, that the water reaches anywhere near the business end of the tip. P. R. Mallory, makers of Elkaloy tips, have worked out a very simple but effective solution. Those interested in good spot welding will get the news pretty soon. Write us if you're interested.—J. G.

Production Men

This is your page.

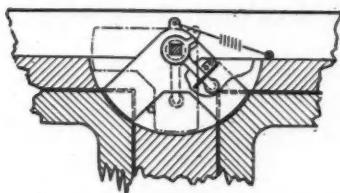
Any suggestions you have on new methods or kinks may be of value to men in other factories.

If you are working on some new development, we'd like to know about it—even if not for publication with your company's name.

Four-Door Coincidental Lock Designed by Walker

AN interesting four-door coincidental lock has been developed in the Walker Engineering Laboratories of Piedmont, Calif., represented in Detroit by the inventor, Brooks Walker, 1415 Parker Ave. This lock, which is mechanically operated, locks all four doors through either the exterior key or a single inside control.

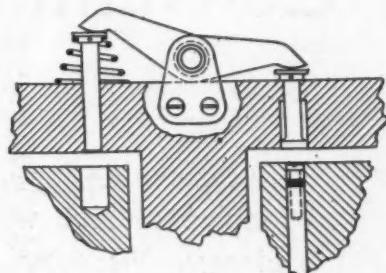
Fig. 1 shows an application of the device to a composite construction body. The push rod in one door, which is operated either by a key from outside



The quadrant-type of lock

or the inside door latch control, serves as a plunger lock, while also actuating the rocker arm to depress a plunger in the door to the rear. The rocker arm is on a cross-shaft which has another rocker at the opposite end to operate two plungers to lock the far side doors.

When the doors are locked with the key which actuates the push rod, no door can be opened either from the outside or by reaching through a window, from the outside, making it possible to lock the cars with the windows down. When one door is accidentally left on the safety catch, the lock will not function. It is also impossible to lock the key in the car.



The push rod in one door serves as a plunger lock and also actuates the plunger in the door to the rear, through a rocker arm

The inside locking feature is a protection against hold-ups, and also serves as a protection for children in the rear of a four-door sedan by preventing the opening of the rear doors by the inside handles.

Each of the plungers involved is retracted by its own spring, so that in case one door should be jammed in an accident the function of the lock on the other doors will not be impaired. Several other arrangements of the same idea are possible, such as the use of a quadrant instead of plungers, the quadrant intercepting slots in the corners of the doors.

Installs Constant Heat-Circulating Furnace

WHILE several different kinds of gas furnaces have been developed for drawing, tempering, etc., they all embody the same method of heating, that of a separate heating chamber, so connected with the furnace by ducts that forced and induced drafts will continually circulate the heated air through both the furnace and heater. A typical installation is a part of the heat treating equipment at one of the plants of the Hudson Motor Car Company, Detroit, Mich.

This unit is employed for drawing steel gears at 400 deg. F. and it requires a heating period of 2½ hours. Consisting of a sheet steel lined with firebrick, this furnace is 30 ft. long, 3 ft. high and 4 ft. wide and sets on legs. The hearth slopes at an angle so that the work will pass through by gravity. Racks with upright spindles on which the gears are stacked, are mounted on casters, and these roll along the hearth from charging to discharging end of the furnace. The racks are kept in a straight line by angle iron tracks in which the casters roll.

At either end of the furnace are a pair of steel plate doors, just far enough apart to hold one rack, and these form a vestibule which prevents infiltration of cold air, or escape of heat, while charging and discharging. An unique method has been worked out by which these double doors are operated. A single lever thrown in opposite directions opens and closes each door in turn. The progress of the racks is controlled by dogs actuated by the same lever.

When the furnace is fully charged and closed, the line of racks is held against a dog, protruding through the hearth, just in front of the inner door (discharge end). Throwing the lever in one direction causes the opening of the inner door and the retraction of this dog, so that the first rack rolls forward until stopped by a second dog, just in front of the outer door. At the same time a third dog rises in front of the second rack to hold the line. The lever is now thrown in the opposite direction and this closes the inner door and opens the outer door, retracting the second dog so that the rack can roll out of the furnace. At the same time the dog holding the line is retracted allowing the racks to move forward until stopped by the dog in front of the inner door.

The operation of the double doors at the charging end of the furnace is somewhat simpler. The lever is thrown to open the outer door so that a rack can be charged into the vestibule where it is held by a dog in front of the inner door. The reversal of the lever causes the outer door to close and the inner to open, the dog is retracted and the rack rolls into the furnace.

Correct temperature is mechanically maintained with an automatic temperature controller and recorder, of the potentiometer type. A motor operating a valve in the gas fuel supply line to the burners is intermittently energized by contacts made by the controller so that the valve is opened and closed according to whether the temperature rises or falls.

Steam Cooling Design Developed by Conventional Features With Closed

Rushmore design, adapted for Ford Model A and B, keeps engine at high working temperatures increasing fuel efficiency. Viscosity of cylinder lubricating oils is reduced, decreasing mechanical losses in engine, particularly in cold weather

A COOLING system combining some of the features of the conventional system with those of steam cooling has been developed by S. W. Rushmore of Plainfield, N. J., and is being introduced on the market at the present time for the conversion of Ford Model A and B cars.

The chief advantages are that the engine is very rapidly brought up to its normal working temperature, and thereafter the cooling fluid in contact with the cylinder walls is maintained at very close to the boiling point, with the result that the fuel economy is increased and crankcase dilution greatly lessened. The system is applicable to all engines except those having the circulating pump set in the forward end of the block and discharging directly into the cylinder jacket.

By maintaining the engine at a higher temperature, vaporization of the fuel is improved and the viscosity of the cylinder lubricating oil is reduced, which latter results in a decrease in the mechanical losses in the engine, particularly in cold weather.

Owing to the materially higher temperature of the outside surfaces of the engine, much more heat is carried away from the engine directly without passing to the radiator, and besides, as a result of the higher fuel

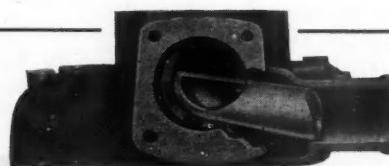
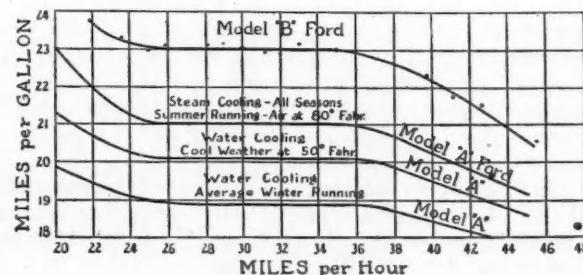
economy, less heat is thrown into the cooling water for a given amount of work done.

There is therefore less heat to be disposed of by the radiator and this is reflected by the fact that the water enters the radiator at from 5 to 10 deg. lower temperature than in a car with the usual cooling system.

The system as applied to the Ford Model A is shown by the accompanying illustrations. Water from the bottom tank of the radiator enters the jacket of the cylinder head close to the forward end, from the left side. A nozzle is set into the inlet which deflects the incoming stream of water toward the pump or water circulator set into the front of this casting. From the outlet of the pump there is the usual hose connection to the top tank of the radiator.

The only other thing that is changed on the engine is the cylinder head gasket, which differs from the conventional gasket in having only four water ports, adjacent to the valve pockets, between the inlet and exhaust valves, through which the jacket space of the

Chart showing effect of cylinder jacket temperature and speed on fuel economy

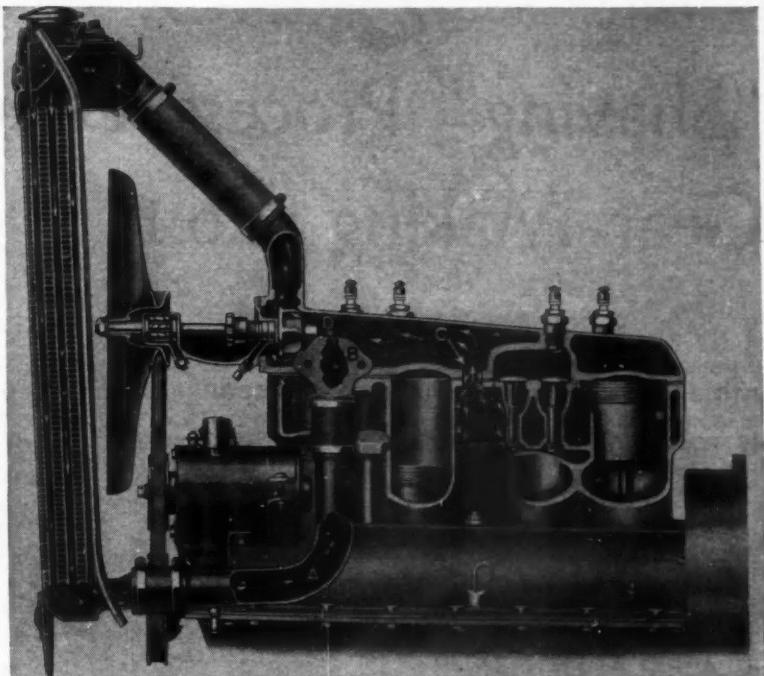


Details of the inlet connection which directs the flow of water toward the pump impeller

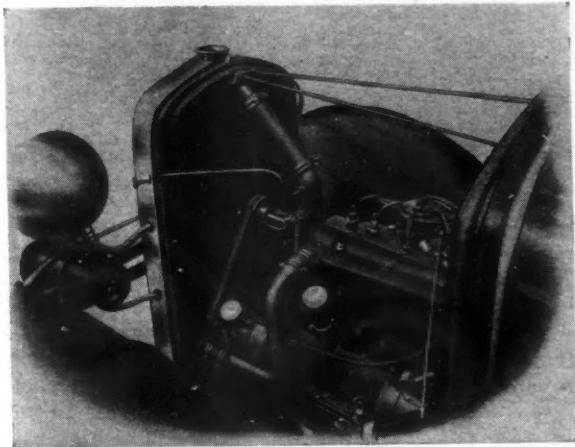
This fitting, which is one of the few extra parts required for the system, consists of two elements, a cast iron nipple welded to the cylinder head and an aluminum elbow secured into the latter at its inner end

Incorporating Water System

by
P. M. Heldt



Illustrating the circulation of water and steam in the Rushmore cooling system as applied to a Model A Ford



The water inlet is at the front of the cylinder head

cylinder block communicates with the jacket space of the head. These two or three ports form both the inlet and the outlet of the cylinder jacket.

Since there is no pump-induced circulation through the cylinder jacket, the water in that jacket is quickly brought to boiling point after the engine has been started up. Steam then forms in the cylinder jacket, as well as in the head jacket, and if the system was completely filled with water in the first place, a certain amount of this water is displaced and forced out of the system.

However, a state of equilibrium is soon attained, and the steam leaving the cylinder jacket then is replaced by water entering it through the same ports. The steam naturally flows in the direction toward the pump, where it is taken up by the stream of cool water entering the pump from the radiator, and is immediately condensed. No steam enters the radiator, and, as already pointed out, the water on entering the radiator is at an even lower temperature than in cars of the

same type with the usual cooling system under the same conditions.

In the operation of this cooling system the interesting observation was made that the jacket temperature never quite reaches the atmospheric boiling point of 212 deg. F. and that it decreases as the car speed increases, although with increased car speed more heat is thrown into the jacket. The explanation was found to be that, owing to the action of the circulating pump, which produces a suction effect on the contents of the jacket, the pressure in the jacket is always below atmospheric, and at this lower pressure, water boils at less than 212 deg. With the Ford Model A at 55 m.p.h. the pressure in the jacket is about 11 lb. p. sq. in. absolute, and at this pressure the boiling point of water is 201 deg. F., which is the temperature indicated by the remote-reading thermometer having its bulb in the cylinder jacket. The cylinder-head jacket temperature under the same conditions is only 190 deg. F.

With the greater rate of heat flow through the cylinder walls at high engine speeds, the temperature gradient through the wall naturally is steeper, and it is conceivable that the combined effects of the lowering of the cooling-medium temperature and the increase in the temperature drop through the walls with an increase in speed are to maintain the oil film on the cylinder wall at a substantially constant temperature.

Since the water in the cylinder and head jackets is always at or very close to the boiling point, the same advantages are obtained as with steam cooling. The cooling is quite effective, as demonstrated to the writer with a car fitted with remote-reading thermometers at several points of the cooling system.

In driving up a long hill at considerable speed and with the brakes applied to load the engine fully, the temperature in the cylinder-head jacket always remained slightly below the boiling point, and there were no signs of detonation.

"Shaving" Process Used To Cut Gear-Making Cost

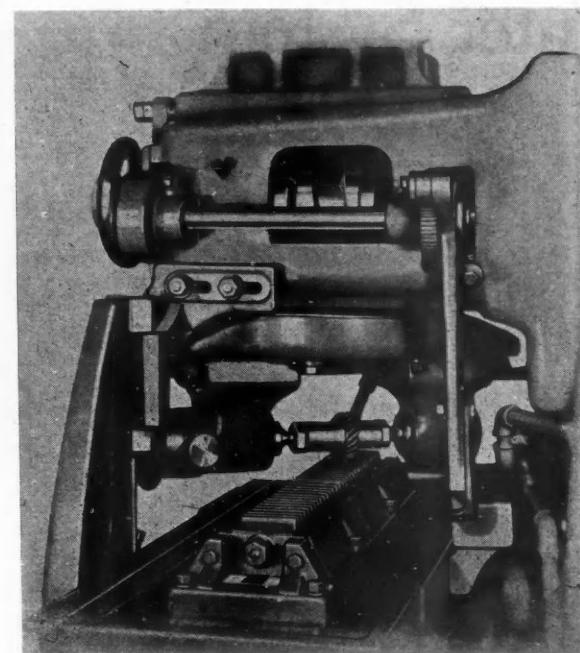
Influence upon automotive design seen as result of new machine tool which makes possible metal camshaft gear trains for automobiles

by Athel F. Denham

AN excellent example of how the development of a new machine tool or manufacturing process can influence automotive engineering is to be found in the new gear-finishing machine recently developed by the Michigan Tool Co. of Detroit, and described briefly in *Automotive Industries*, April 23, 1932.

While the tool and the process can be used to replace existing gear-finishing machines in an established production set-up, an even more interesting possibility is opened up in the designing of drives in which gears produced by this process are being considered.

Basically what the machine tool does is to pro-

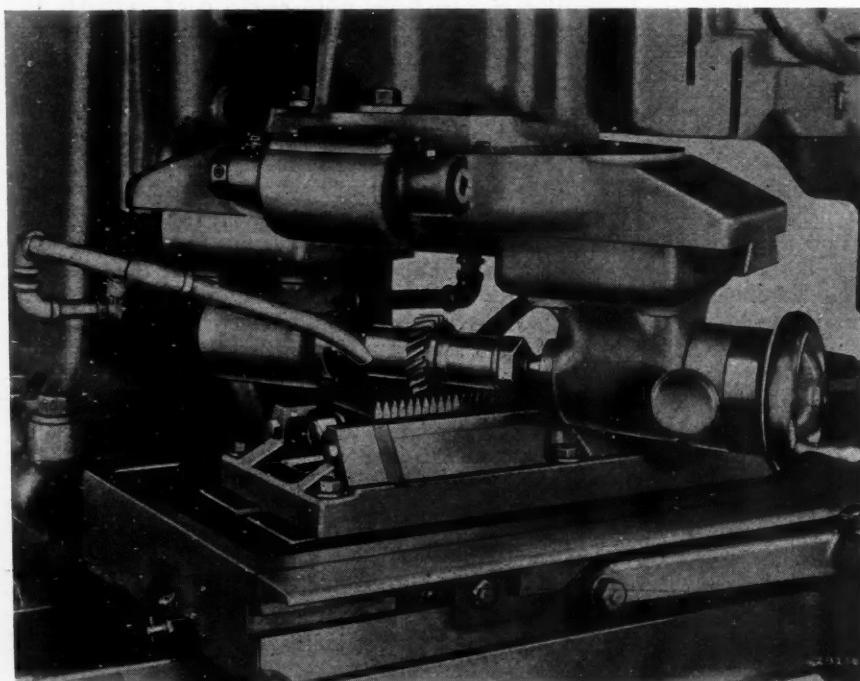


Michigan Tool Co.'s gear machine for rapid finishing of spur or helical gears

duce highly accurate and uniform gears at a low cost, by a "shaving" process. In doing so it opens up the possibility, for instance, of using all-metal gear trains for camshaft drives. Gear noise, which has prevented consideration of such a drive in past

years, is largely traceable to inaccuracies in the finishing of gears. The new process, by giving more accurate gears, reduces noise materially, with the result that already at least two automobile manufacturers are considering the possibility of all-metal camshaft gear drives.

The development is particularly important in consideration of the work progressing on lower-priced automobiles, for it is claimed that the new process materially reduces the cost of finishing gears. That there must be some basis for this claim is illustrated by the fact that already some 35 of these new machine tools have been sold to some ten automotive customers. In these plants they



Involute rack, made up of separate sections, about which the gear is rolled to required finish and accuracy

are used for the finishing of spur and spiral gears for existing timing drives and transmissions.

Lowered costs of finished gears are claimed to be due to four factors:

1. Class "B" tolerance ground hobs can be used for the previous roughing operation. These hobs are said to cost approximately 20 per cent less than Class "A" tolerance hobs.
2. Users of these machines are finishing from 10,000 to 35,000 gears per grind of the cutting racks, depending on the stock removed. Michigan Tool guarantees from 15 to 25 regrinds during the life of the rack.
3. Average number of gears finished per hour on the machine by users is around 90. Michigan Tool guarantees 60. Some customers finishing as high as 160 per hr.
4. Possibility of substitution of metal gears for more costly designs of materials.

As an indication of the accuracy available, Michigan Tool specifies the following tolerances for transmission gears:

Eccentricity	0.001
Involute form	0.0002
Helix angle	0.0002 per in.
Spacing, tooth-tooth	0.0002
Tooth contact	85 per cent minimum

These guarantee figures represent a 50 to 75 per cent reduction in tolerance figures from conventional practice.

The accuracy which accounts for the quietness of the gears is, of course, dependent on the rack, which is ground and lapped to a finish. In the production of spur gears a spiral rack is used, and in the production of helicals a straight rack, except in the case of high helix angles. Most satisfactory results have been obtained with helix angles of approximately 30-35 per cent, so that a gear with a 45 per

cent helix angle would probably be cut on a rack with a spiral of approximately 10 to 15 deg.

Carburized gears can also be finished with the machine. In such a case the roughing cut is taken, the gears are carburized, then finished by the "shaving" process, and then hardened. Approximately 0.004-0.008 in. of stock should be left for the finishing operation.

The machine itself is somewhat of the "planer" type. A counter on the machine is set for a predetermined number of strokes. Vertical feed is by a trip valve which releases a definite amount of oil. Vertical may be anything from 0.00025 up. Average about 0.001 in. feed. Average stock removed runs about 0.004-0.006 in. for the operation.

A solid stop is provided for the machine when it has reached the final position, and the gears could continue rolling over the cutting rack indefinitely thereafter without affecting size or finish, obviously.

It is obvious also that considerable modification in tooth form is made available with this process. For instance, pressure angles from side to side of a tooth can be made different without difficulty. After the desirable tooth forms have been found, uniformity should be assured.

The machine will also finish white metal, aluminum and fabric gears, etc.

In some cases gears produced by this method retained synchronous noise periods, but it is claimed that in practically every case these were eliminated or reduced to a minimum by changes in gear form, as in varying the helix and pressure angles.

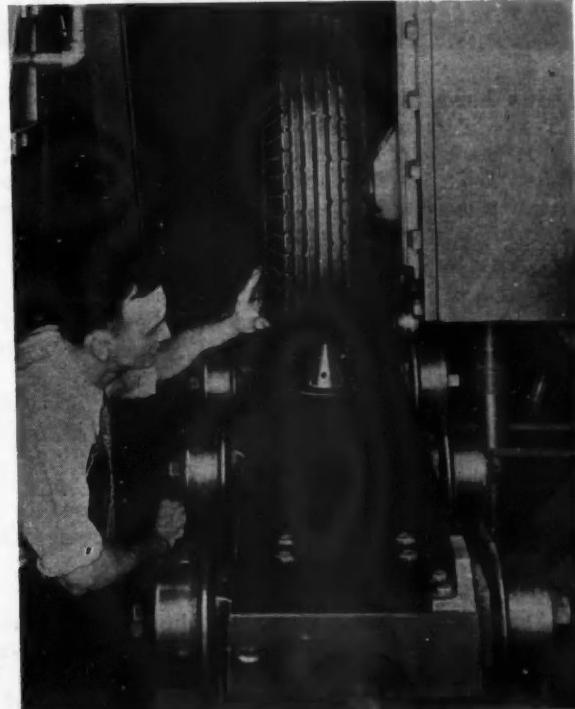
It is understood that Michigan Tool will shortly introduce a lapping machine on the same principle as the gear finisher. This machine is claimed to be able to lap gears with 100 strokes as against the normal 400, and produce gears at the rate of one a minute. This machine will be recommended for lapping gears distorted or damaged in the hardening process.

New Machine Tests Resistance Of Tire Tread to Rupture

A NEW type of rupture-testing machine which subjects a tire to impact similar to that encountered on the road has been designed by United States Rubber Products, Inc., and installed in its tire development laboratory. This machine enables engineers to determine in a short time how severe a blow a tire will absorb before the casing breaks.

In operation, a tire mounted and properly inflated for a definite load is attached to a vertical column of the machine, so that the wheel may revolve freely. A steel point is fixed to a movable horizontal table, corresponding to a roadway. The tire is pressed against the table by a force equal to a car's weight, and the table is made to run under it so that the tire, with traction applied, rolls over the steel point.

At the spot where the tire strikes the steel point the tire is marked to show the height of the point. The points used in the test vary from 2 to 4½ inches in height, in steps of ¼ in. The tire is struck in a different place each time, and the machine is operated until a steel point is used which is sufficiently long to rupture the casing.



Automotive Oddities—By Pete Keenan



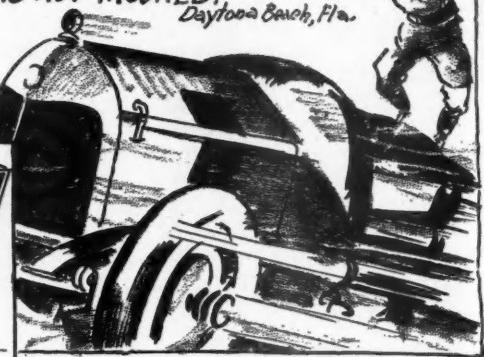
**WALTER E.
FLANDERS**
WAS THE FIRST BIG
PRODUCTION MAN.
EMPLOYED BY FORD,
HE MADE A \$20,000 BONUS
THE FIRST YEAR.

WAY'S MUFFLERS
TO PROTECT
CHEST AND THROAT
WERE BEING OFFERED
TO MOTORISTS, 1906.



FAUSTO VERANZIO
WAS THE FIRST KNOWN
HUMAN BEING TO
USE A PARACHUTE
Venice, 1617.

MILLE. JOAN LA COSTA
JUMPED FROM AN AUTOMOBILE
TRAVELLING 130 MILES AN HOUR
AND WAS NOT INJURED.
Daytona Beach, Fla.



QUICK WASHING.
Corrugations in the floor surface of
this pool causes vibration so that mud
is loosened and washed off.

Write us if you know an oddity

The NEWS TRAILER

It's hard to please George W. Scheirten, Borger (Tex.) fireman. He assembled a car from the parts of 10 standard makes of cars. The spare tire was taken from an airplane, and the rear brakes are of his own design. The car, he says, will run 60 m.p.h. and do 30 miles on a gallon.

Chicago headlines this week have had to do with Edward A. Dato, automotive engineer, who by sheer chance got into the real estate business with the late Mrs. Edith Rockefeller McCormick. In 1906 he trudged out of revolution-torn Russia and worked his way through school in Switzerland. Coming to this country he was employed by International Harvester, then headed by Mr. McCormick, and through his school-days chum, Edwin Krenn, joined in Mrs. McCormick's realty ventures—and now owns 5/12ths of her estate by assignment.

Another "stepping stone" of the industry sank in the depression mire this week when the five-story home of the Automobile Club of America, 12 East Fifty-third Street, New York, was auctioned off for

back taxes. Here the first automobile show was planned; here the first race rules were established.

Out across the rough woodlands of Saskatchewan's wastes dog teams only can carry freight through during the long winters. But the dogs must be exercised strenuously during the summer, when air transport carries merchandise. One enterprising dog teamster hooks his huskies to an automobile during the summer months—and saves gasoline!

James Haizlip, diminutive St. Louis pilot, left Los Angeles Tuesday morning, took a bow at the Cleveland airport 8 hr. 19 min. 45 sec. later, winning the Bendix Trophy and \$7,500, gave his Pratt & Whitney Wasp Junior the gun through a drenching rain and ground fog, and landed in New York 1 hr. 59 min. 14 1/5 sec. later, establishing a new transcontinental record of 10 hr. 19 min. 4/5 sec. This was 56 min. 59 1/5 sec. under Major Jimmy Doolittle's mark of a year ago. The tiny Weddell-Williams plane was equipped with a 300-hp. Wasp, supercharged to 1.4 atmospheres, bringing its output up to 350 hp.

NEWS

Fisk Plans Completed

Successor Committee is Proposed by Receivers and Financial Group

NEW YORK, Aug. 30—Plans for the reorganization of the Fisk Rubber Co. have been completed, it was announced yesterday by the committee in charge, comprising Orrin G. Wood, chairman; Karl H. Behr, Carl P. Dennett, William E. Gilbert, Harold P. Janisch, Theodore G. Smith, W. B. Stratton, John C. Traphagen and John N. Willys. The receivers, Charles A. Dane and John Pierce, have recommended acceptance of the plan.

There is to be a cash distribution of \$400 for each \$1,000 bond and \$370 for each \$1,000 note, and it is proposed to form a successor operating company to continue the Fisk business and a real estate company into which will be placed certain mortgaged property not required by the operating company.

The company will have an authorized capitalization of \$4,000,000 6 per cent preferred stock, cumulative after Jan. 1, 1934, and 400,000 common shares, in addition to such additional stock, not exceeding 300,000 shares, as may be subscribed for by stockholders of the old company.

It is proposed to distribute all the issued preferred stock, together with about 400,000 common shares, to the holders of bonds and notes and other creditors, the last representing a small amount.

Stockholders will have rights until Oct. 10 to subscribe for about 300,000 common shares for cash at \$2.50 a share.

Stutz to Buy Pak-Age-Car

INDIANAPOLIS, Sept. 1—Stutz Motor Car Co. of America, Inc., has completed negotiations, subject to the approval of the directors of the respective corporations, for the acquisition of controlling interest in the Pak-Age-Car Co., now held by the Mechanical

Manufacturing Co., one of the Swift & Co. interests in Chicago.

Approximately \$2,000,000 has been spent in the development of this door-to-door delivery vehicle, the purchase of inventory and initial sales effort.

The cars will be built in the Stutz factory at Indianapolis.

One of the outstanding developments is the fact that the powerplant of the Pak-Age-Car is assembled as a unit together with the rear springs, hubs, wheels and tires and can be easily replaced by a spare powerplant within 15 minutes without entering the vehicle or disturbing the load.

Alfred P. Sloan, Sr. Dies at Plandome

Father of President of General Motors Was Retired Partner of Importing Firm

PLANDOME, L. I., Aug. 30—Alfred Pritchard Sloan of 35 Fifth Avenue, New York, retired business man and father of Alfred P. Sloan, Jr., president of the General Motors Corp., died early this morning at his summer home here after an illness of several weeks. He was 82 years old.

He began his business career as a grocery clerk in New Haven. About 1880 he became a partner in the firm of Bennett, Sloan & Co., tea and coffee importers, remaining in New Haven until 1886, when he moved to Brooklyn. At that time a branch of the firm was established in Manhattan. Mr. Sloan remained a partner in the importing firm until 1916, when he retired from active business.

In the '90s Alfred P. Sloan, Jr., became an employee of the Hyatt Roller Bearing Co. in Newark, N. J.

When that company faced financial difficulties the senior Mr. Sloan invested heavily in it. Under the management of his son, who became president of the company, the concern prospered, especially after the popularity of automobiles increased.

The elder Mr. Sloan served as treasurer of the company for some years and continued his financial interest in it until 1916.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, Sept. 1—Prices of stocks, bonds and commodities continued to advance last week. No definite upturn in the rate of general business activity has yet appeared, although improvement is reported in some branches of wholesale and retail trade, as well as in certain light manufacturing lines.

GUARANTY INDEX DOWN

The index of business activity of the Guaranty Trust Co. for July stands at 51.9, as against 54.6 for June and 77.8 for July, 1931. The company's wholesale price index for Aug. 15 is 37.5, as compared with 35.2 a month earlier and 48.7 a year earlier.

FREIGHT INCREASING SLOWLY

The movement of railway freight continues to increase slowly. Loadings during the week ended Aug. 20 totaled 518,642 cars, showing an increase of 6211 cars above the total for the preceding week, but a decrease of 229,958 cars below that for the corresponding period last year.

The decline from the figure of a year ago was the smallest percentage decrease for any week since June 18, with the exception of the seven days ended July 2, which was thrown out of line by observance of Independence Day.

Total loadings for the year to date amount to 17,572,111 cars, as against 24,272,173 cars in the similar period a year ago, and 29,667,750 cars two years ago.

INDUSTRIAL EMPLOYMENT DOWN

Industrial employment decreased 3 per cent from June to July, according to the monthly report of the Department of Labor, while total payrolls declined 6.1 per cent. The corresponding declines in manufacturing industries alone were 4 per cent for employment and 7.9 per cent for total payrolls.

The index of employment in manufacturing industries for July stands at 55.2 per cent of the 1926 average, as against 57.5 in June and 71.7 in July, 1931, while the payroll index stands at 36.2, as compared with 39.3 in June and 60.3 a year ago.

ELECTRIC PRODUCTION OFF

Production of electricity by the electric light and power industry of the United States for the week ended Aug. 20 was 12.9 per cent smaller than in the corresponding period last year.

Decreases ranged from 8.8 per cent in the Atlantic seaboard district to 16.3 in the central industrial region.

BANK DEBITS

Bank debits to individual accounts outside New York City during the week ended Aug. 24 were 29 per cent below the total for the corresponding period last year. The total for the year to date is also 29 per cent below that of a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended Aug. 26 recovered the loss recorded for the preceding week, standing at 61.9 per cent of the 1926 average, as against 61.8 a week earlier.

The index shows an almost uninterrupted advance since the middle of June.

RESERVE STATEMENT

Bill and security holdings of the Federal Reserve banks declined \$17,000,000 during the week ended Aug. 24, with decreases of \$16,000,000 in discounts and \$1,000,000 in holdings of bills bought in the open market.

For the second successive week holdings of government securities remained unchanged.

National Committee to Induce Industry to Replace Obsolete Tools, Equipment

Robertson, Westinghouse Chairman, Heads Group of Industrialists on Rehabilitation Program, Pointing to New Credit Laws As Aid to Buying

PITTSBURGH, Aug. 29—"Financial and credit affairs are clearly and positively better. In fact, it might well be said that whatever weaknesses there were in the financial situation have been corrected or are in the process of being cured," according to A. W. Robertson, chairman, Westinghouse Electric & Mfg. Co., recently named head of the National Committee on Rehabilitation.

Speaking today to a large group of the business and industrial leaders of this district at the Chamber of Commerce, Mr. Robertson outlined the purpose and plans of his committee. This was the official inauguration of the activity of this committee, which, it is confidently expected, will help put industry back into the swing of production and men back to work.

At the conference of Business and Industrial Committees held in Washington Aug. 26 and 27, a Central Business and Industrial Committee was created and a program of activities authorized. Mr. Robertson was asked to head up an organization known as the National Committee on Rehabilitation.

The purpose of the rehabilitation committee is to induce manufacturing and other industries to make capital expenditures now for the rehabilitation of plant and replacement of obsolete and worn-out equipment.

"Improvement or alteration work done now would be helpful in many ways. It would help unemployment. It would cost less. It would interfere little with routine production," said Mr. Robertson.

In discussing some basic reasons why business would be justified in spending money now for rehabilitation and modernization, Mr. Robertson said:

"Reserves in the Federal Reserve Banks, beyond what they are required by law to maintain, are above \$300,000,000. Potentially such reserves suggest the basis for expansion of bank deposits or, on the other side of the balance sheet, bank loans and investments of approximately \$3,000,000,000.

"In the past, large excess bank reserves have produced credit expansion. In the coming months, as confidence returns and as funds are required by business, it is natural to expect that the law of credit expansion under like circumstances will work and that these excess funds will be put to use. This will tend to raise prices and to stimulate business generally."

"Under a recent law national banks

may issue national bank currency against additional bonds other than those formerly eligible as a basis for circulation. It is certain that a substantial amount of additional national bank currency will be provided from this source and make an important addition to the excess reserves in banks which will have the same effect of inducing credit expansion."

Mr. Robertson feels that these trends are definite and actual, and that while the amount of credit expansion which they will induce may be a matter of guesswork, it is reasonable to assume that it should amount to more than five billion dollars.

"In the past," he said, "this has always resulted in expansion of bank credit, and there is every reason to believe that the same thing will happen at this time. It is also true historically that there is a national relationship between the use of bank credit on the one hand and business activity and prices on the other.

"Therefore, it is fair to assume that, barring unforeseen events, we are coming into a period of business activity and advancing prices. The recent rise in security and commodity prices would seem to bear out these conclusions."

Continuing, Mr. Robertson said, "The questions which men of affairs should ask themselves are:

"Have we arrived at the period when we should set our respective business houses in order in preparation for an early business revival, or stated in a somewhat different way: Have we arrived at the period when the country has been sufficiently deflated to make a concerted effort to start business in the other direction not only advisable, but absolutely necessary?"

Up to the present time those who have accepted membership on the National Committee on Rehabilitation under Mr. Robertson's chairmanship are:

E. T. Weir, vice-chairman, chairman, National Steel Corp.; John E. Zimmerman, chairman, Rehabilitation Committee, Third Federal Reserve District, president, Philadelphia Electric Co.; J. E. Lewis, president, Harbison-Walker Refractories Co.; H. S. Wherrett, president, Pittsburgh Plate Glass Co.; Malcolm Muir, president, McGraw-Hill Publishing Co.; J. S. Tritle, vice-president, Westinghouse Electric & Mfg. Co.; Robert F. Pack, chairman, Rehabilitation Committee, Ninth Federal Reserve District, president, Northern States Power Co.; Phillip P. Bliss, chairman, Rehabilitation Committee, Fourth Federal Reserve District, president, The Warner & Swasey Co.; F. J. Moss, chairman, Rehabilitation Committee, Tenth Federal Reserve District, president, American Sash & Door Co.

World Trade Now Appears Brighter

Mooney, G. M. Executive, Says Lausanne and Ottawa Agreements are Favorable

NEW YORK, Aug. 30—Sailing last night on the Bremen for a two-months' visit to his company's plants in Europe, James D. Mooney, vice-president, General Motors Corp., in charge of overseas operations, expressed himself as being encouraged by recent developments in the field of international economics and trade.

"Two very hopeful things have happened in the past three months," Mr. Mooney stated, "that point to ultimate relief from the strangling influences that are destroying international trade and that are having, consequently, such a disastrous effect upon our own domestic welfare.

"The first of these things is the Lausanne Agreement. If this agreement is followed through to its logical conclusions, it will lift a crushing burden from the shoulders not only of Germany but of the whole world.

"Our own sales in Europe began to show a better tone immediately after this agreement was reached, but more encouraging still is the evidence provided that creditor nations are beginning, really for the first time, to examine the debts owing to them in a business-like manner and from the standpoint of their own enlightened self-interest.

"The second event of importance is the Imperial Economic Conference at Ottawa. I consider the courageous move on the part of the British nations for a freer interchange of goods among themselves within the Empire, through the medium of the reciprocal, bargaining tariff agreements arrived at, to be a constructive and advantageous thing.

"There is, for example, an increased appreciation of the vital importance of foreign trade to our own domestic well-being, and a more general disposition to look upon the war debts as an element in our foreign trade position which must be dealt with farsightedly and constructively.

"Above all, a new conception exists on every hand of the rather simple economic fact that maximum prosperity depends upon maximum trade, and that we cannot possibly become more prosperous by attempting deliberately to choke off our foreign commerce.

"This conception has led to a tremendous growth of sentiment favorable to the removal of those artificial barriers which are impeding the two-way exchange of goods internationally today, and I feel very certain that we shall follow the example of the other nations of the world in seeking mutual concessions that will secure to us the wider markets for our goods that we so vitally need."

Holds Consumer Credit Should be More Available

C. C. Hanch Calls Upon Federal Reserve to Make Finance Paper Rediscountable to Aid Buying

CHICAGO, Aug. 31—Consumer credit for the man and woman employed can and should be cheaper and easier to get, according to C. C. Hanch, general manager, National Association of Finance Companies, and it is within the power of President Hoover and his coming business and industrial conference to make it so.

Mr. Hanch today appealed to the 200 business leaders who were summoned to the President's conference for the purpose of organizing a program of action along "the whole economic front" to relieve the "pernicious anemia" from which business is suffering by making notes of finance companies eligible for rediscount at Federal Reserve Banks.

This would not draw upon the resources of the Reconstruction Finance Corporation nor get the Government deeper into debt, he pointed out. The stability of the dollar would not be threatened, but the rediscount privilege would increase consumption, production and all other activities of business.

"If finance company paper is made eligible for rediscount, banks can loan more freely to finance companies and

still retain their liquidity," said Mr. Hanch.

"There is no question about the soundness of this paper. Many bankers have told us it is the safest in their portfolios. The fact that bankers can not take this paper to the Federal Reserve Banks causes them to limit the amount they will loan for financing instalment purchases.

"Credit has always been, and still is, more readily available for production and distribution than for ultimate purchasing. If we are to have a return of prosperity we must have credit for consumption extended under the sound principle that it shall be measured by earnings. There are more than thirty million persons in the country who are gainfully employed and entitled to consumer credit.

"The man or woman who has a job or an income and a habit of honesty is entitled to credit. We do not need to wait until Congress convenes. Legal experts have told us that the Federal Reserve Board can do this without enabling legislation, and there is no question but that they would act if President Hoover's conference so advised."

the exception of the steering wheels of the tractor, carrying dual tires. All wheels except the trailer front wheels are equipped with Bendix-Westinghouse air brakes.

In the tests at the Indianapolis Speedway the total weight of the loaded train was 123,270 lb., of which 80,110 lb. was pay load. The train was run for a distance of 100 miles with full load and attained an average speed of 28.68 m.p.h.

It was accelerated from a standstill to 20 m.p.h. in 20 sec. and was stopped from a speed of 20 m.p.h. in 65.3 ft. or in 3.46 sec. The fuel consumption was at the rate of one U. S. gallon per 1.82 miles. This makes the transportation efficiency a little more than 112 ton-miles per gallon.

Philadelphia Unemployed Engineers Get "Break"

PHILADELPHIA, Aug. 31—With the aid of the Philadelphia Technical Service Committee, 124 technical men have secured employment in the past six months.

The men enrolled have had experience in 115 different occupations, in over 200 diverse industries, and include 70 types of engineers. They now number close to 1000.

Weather Factor In Aero Crashes

Nearly Half of 67 Accidents Caused by Dark, Poor Visibility

WASHINGTON, Aug. 31—American operated air transport services flew 24,668,414 miles in the first six months of 1932 with 67 accidents, or 368,185 miles per accident, it was announced today by Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. Only six of these accidents involved passenger fatalities, while 11 accidents resulted in pilot or passenger fatalities.

The semi-annual report on civil aircraft accidents in scheduled air transport services for the period January to June, 1932, showed that the causes of the 67 accidents were divided as follows: Personnel errors, 10.96 per cent; powerplant failures, 22.39 per cent; airplane failures, 19.26 per cent; miscellaneous (this classification including weather, darkness, and airport and terrain), 47.39 per cent. There were no aircraft accidents concerning which the cause was undetermined or doubtful.

In a study of the injuries and fatalities occurring in scheduled air line accidents during the first half of 1932 it was found that 10 persons suffered minor injuries and 27, including 16 passengers, 10 pilots and 1 co-pilot, lost their lives.

In all, there were 199 persons involved in scheduled air transport accidents, of whom 162 received no injuries whatever. A total of 248,954 passengers were carried during the period.

The accident report is based on the findings of the accident board of the Aeronautics Branch, which is composed of two pilots, a flight surgeon, an aeronautical engineer, a lawyer versed in air law and a statistician. This board investigates and determines the causes of all civil aircraft accidents by analyzing all accidents reported from the field and reducing them to their causation factors expressed in percentages.

Founder Retires From Weldon Tire Co.

BIRMINGHAM, ALA., Aug. 29—James E. Weldon has retired from the Weldon Tire Co., which he founded as the Weldon-Martin Tire Co. in the early days of the industry. His retirement has been caused by ill health.

C. O. Read succeeds him as head of the concern. He has been with the Fisk Tire Co. more than four years, having begun as office manager in Jackson, Miss., in 1928. In the next year he was transferred to New Orleans as office manager of the factory branch under C. F. Batton, zone manager.

Texans Organize to Fight Restrictive Motor Taxation

Program to Battle for Repeal of Discriminatory Legislation Begun By Vehicle Owners of All Classes

AUSTIN, TEX., Aug. 30.—Faced with rapidly accumulating proposals to increase motor truck taxes and restrictive regulations, truck owners of all classes in Texas have united with dealers in automotive equipment, accessories, and supplies to form the Texas Motor Transportation Association, with headquarters here in the state capital.

The new organization supersedes the Texas Truck Owners Service Bureau, composed largely of operators for hire and large fleet owners, and includes within its membership all owners of trucks, regardless of weight, size or scope of operation.

Bakers, dairies, bottlers, grocers, hardware houses, wholesalers and other commercial firms using trucks in their business, operators for hire, both intercity and intracity, and dealers in trucks, tires, batteries, oil, gasoline, grease and other equipment, supplies and accessories, as well as employees of all the foregoing classifications, are eligible for membership in the association, which promises to be the largest trade organization in the state by the first of the year.

An active legislative program to repeal or modify existing statutes that are designed for the protection or benefit of competing forms of transportation rather than for the benefit of the public and which destroy or hampered the fullest usefulness of motor transportation will be carried on by the association.

Vigorous opposition to the passage of other measures of this type will

also be offered at the Legislature, and every effort will be made to restrict legislation to genuine safety measures and similar bills.

Specific adverse measures that confront the industry in Texas include the wheel tax, mileage tax, ton-mile tax, gross receipts tax, increased gasoline tax, privilege taxes on practically all dealers in automotive equipment, supplies and accessories, occupation tax and local taxes to be levied by cities on all motor vehicles using their streets, in addition to all other taxes now paid by the carriers.

Most if not all of these taxes are of the type that cost the state as much or more to collect them as they yield in revenue. The motor carriers contend that the state derives no benefit from these taxes and that they take away from the public certain economies of transportation that would otherwise be enjoyed.

Widespread publicity on facts and figures connected with the industry, most of which are unknown to the press, public, legislators, and even the operators, will be given in an effort to counteract misleading propaganda which has been spread throughout the state in recent years. If possible, one or more advertising campaigns will be carried on along the same line.

Wholehearted support and endorsement of this program have been given by the national manufacturers of motor trucks and by the National Automobile Chamber of Commerce.

French Car Sales Show Little Change

In its month's survey of French trade, the American Chamber of Commerce in France has the following to say on the subject of automotive trade in its Foreign Trade for August:

"Sales of motor vehicles during the past month showed little change from May. Total domestic production during June was about the same as in the preceding month.

"The new foreign eight-cylinder models of a popular low-priced American make now are being run off the line in the local assembly plant, but deliveries are still behind orders. A further recession in the sale of medium and high-priced American makes was noted during the past month.

"The market for used cars is very active, and stocks of these are normal or even under normal. Stocks of most makes of French passenger cars are

high. The truck market remains good, with Citroen continuing to obtain fully half of the low-price business."

Commercial Credit Votes Dividends

BALTIMORE, Aug. 29.—At the regular meeting of the board of directors of Commercial Credit Co. regular quarterly dividends on the 6½ per cent and 7 per cent first preferred stocks, 8 per cent Class "B" preferred and the \$3 Class "A" convertible stocks were declared, payable Sept. 30, 1932, to stockholders of record at the close of business Sept. 10, 1932.

In view of the approaching dull season and the continued decline in current volume of business and reduction in amount of receivables outstanding, which will probably show no material improvement before next March, the directors decided to take no action on the dividend on the common stock.

Steel Men See Turn in Offing

Price for Last Quarter Will be Reaffirmed, Is General Belief

NEW YORK, Sept. 1.—With the turn of the month steel sellers serenely look forward to a gradual quickening of automotive demand. There is every indication that third quarter prices will be reaffirmed for fourth quarter business.

For sheets this would mean more or less of an advance, a good deal of business having been billed of late at prices below those looked upon as "official" quotations.

Black sheets have been selling of late on a 2.10 cents, Pittsburgh, basis which denotes a \$2 per ton decline from the regular quotation and which has become fairly general, although some rollers assert they are adhering to the 2.20 cents quotation without, however, having done any worth while business at that level of late.

According to some reports, efforts on the part of certain consumers to place orders for hot-rolled strip at below 1.45 @ 1.50 cents, Pittsburgh, base failed to succeed, rollers being unwilling to grant concessions even though round tonnages were ordered.

So far there has been no definite indication as to the price trend of full-finished automobile sheets. No revival in the demand for these is looked for until orders for 1933 models are being placed.

While the general impression made by the steel market at this time is that price changes are likely to be few, but that with more buying a firmer tone is likely to develop on the prevailing price basis, forward looking buyers are not blind to other developments all of which point in an upward direction for any price movement.

Virtually all of the non-ferrous metal markets have developed a rising tendency.

Broader demand for pig iron portends a stiffening of prices for that essential commodity.

Pig Iron—Gains in sales as well as shipments are reported by most of the markets and prices have a firmer appearance, although no advances have been reported so far.

Aluminum—Better demand in September is forecast by Cleveland and Detroit remelters and alloy makers who have sounded their customers as to when they may look for more liberal releases.

Copper—Most producers are unwilling to sell at 5.50 cents, Connecticut Valley basis, at which some electrolytic copper is still obtainable. Very little broadening of the demand is looked for until another advance is chalked up.

Tin—Straits tin sold on Monday at 24½ cents which was 3 cents per lb. higher than the market price a month ago, an advance of approximately 14%.

Lead—The lead market has advanced \$10 a ton over the price in vogue a month ago, the demand continuing active at 3.50 cents, New York the leading interest's contract quotation at the beginning of the week.

Engineers, Race Drivers, Propose New Rules for Indianapolis Race

Fuel Limit, More Starters and Minimum Weight Adjustments Are Suggested for Committee's Approval

INDIANAPOLIS, Aug. 29—Rules that would create new thrills, action and spectacular moments in the 1933 international 500-mile race here next May, have been suggested by automotive engineers and racing devotees and are now being investigated for acceptance or rejection.

Limiting fuel to necessitate at least three pit stops, increasing the number of starters, and adjusting the minimum weight requirements were among important changes suggested by a group of engineers and racing experts.

Suggesting that only fifteen gallons of fuel be permitted in all the cars would mean that race cars would have to halt at the pits at least three times during the race, since average fuel consumption is ten miles to the gallon. If this change is adopted it would mean that the pits would constantly afford a scene of activity and would necessitate a return to the old days of spectacular pit crews, every motion being timed to effective precision of movement. Lubricating oil would be limited to a total of six gallons.

Instead of increasing the speed limit now specified at 100 miles an hour for ten miles, it is suggested by the engineers that cars travel twenty-five miles to qualify for the starting mark. The increase in mileage traveled to qualify would more nearly approximate actual racing conditions, engineers contend.

Forty-two cars would be permitted to start in the race instead of forty which now face the starter. This would make fourteen rows of three cars each rolling down the stretch in a flying start. Only a few years ago the field was limited to thirty-three cars.

Minimum weight restrictions would be changed from seven and one-half pounds per cubic inch of piston displacement to seven pounds with a final

minimum weight of 1950 lb. instead of 1750 lb. which has been the rule. This change is designed to place semi-stock cars on a more equal footing with the specially built racers.

Because of the wide variation of treads in stock production and the narrowing of treads in Europe it is suggested that the tread for the 500-mile race be any width between 52 and 65 in. and that the steering angle of any race car be a minimum of 20 deg. Fire dashes, the division between the driver's compartment and the engine, must be 3/16ths of an inch thick if made of aluminum and 1/16th if fashioned of steel.

Another proposal is that every car be equipped with an efficient self-starter, whether that be air, electric or inertia. The reason for this is that with smaller tanks and increased pit stops continued cranking would be too much of a burden for the pit crew and with starters the pit apron would clear up its traffic much more rapidly.

Two committees were appointed to study two phases before submitting suggested rules. Barney Oldfield heads a committee to study the wire wheel situation. Racing cars have used flat-rimmed wheels as it was difficult to keep flat tires on with drop center rims. Now the wheel makers suggest a modified drop center rim wheel which they assert will retain the flat tire. Oldfield's aides are: E. Waldo Stein, Firestone Tire & Rubber Co.; C. S. Ash, Kelsey Wheel Company, and Louis Schwitzer, Schwitzer-Cummings Company.

Every rule change suggested was made to improve the cars participating in the 500-mile race, give the automotive industry more information as a result and further increase the interest of the manufacturer and the fans in the world's most famous automobile speed test.

Rural Canada Being Rapidly Motorized

OTTAWA, Sept. 1—There are 726,623 farms in Canada and automobiles on 321,306 of them. Motorization of rural Canada has been proceeding rapidly.

According to government figures just released, automobiles on farms in Canada have doubled in the past 10 years. There is now a car for every 2.27 farms and the likelihood that this ratio will continue to change steadily.

Ontario has more cars to the farm than any other province, with an average of one for every 1.53 farms, and Quebec has the smallest ratio, with one for every 5.106 farms.

Saskatchewan ranks after Ontario with one in 2.10; Manitoba, 2.12; Alberta, 2.27; British Columbia, 2.46; New Brunswick, 3.26; Prince Edward Island, 3.31, and Nova Scotia, 3.83.

Harry L. Cunningham

DETROIT, Aug. 30—Harry L. Cunningham, 50, veteran automotive magnate and recently a member of the brokerage firm of W. E. Hutton & Co., died suddenly here on Aug. 27.

An associate of Walter Flanders, he was an executive of the E-M-F Motor Co. and later was secretary of the Rickenbacker Motor Co.

Next Week—

W. K. Toboldt, whose pre-race and race stories describing the entrants and the contest at Indianapolis appeared last May in *Automotive Industries*, will write again for this magazine next week.

He is analyzing the proposed changes in the Indianapolis rules, and will discuss their relationship to stock and semi-stock cars.

Will passenger car factories turn back the pages of history and again become vital factors in race track driving?

Read all about it in the Sept. 10 issue of *Automotive Industries*.

Banks Block Car Sales, Is Report

Philadelphia Dealers Charge Prospects Are Urged Not to Buy

PHILADELPHIA, Sept. 1—The Philadelphia Automobile Trade Association yesterday censured local savings banks for opposing and delaying the withdrawal of deposits to be used in the purchase of automobiles.

W. P. Berrien, executive secretary of the association, estimated that nearly 250 new car sales, having a total value of approximately \$190,000, have recently been lost to Philadelphia dealers through the action of "certain savings institutions."

"The attitude of the banks is so opposed to this theory that we want to call the public's attention to this recent development.

"It is fair to assume that those who, by thrift, have created a savings account have equally established the right to prompt treatment when evidence of actual buying is apparent and where the money withdrawn is actually to be put into circulation."

Franklin Payroll Up, Dealers Show Optimism

SYRACUSE, Sept. 1—Payroll of the H. H. Franklin Mfg. Co. for the week just closed was the largest for any period within the last three months.

Franklin dealers have reported sales influenced largely by the improved sentiment that started with the rise of the stock market. The demand has reduced dealers' stocks of cars almost 20 per cent under the corresponding figure of one month ago.

Farman Plane Makes Flight

PARIS (Special)—The first test of the Farman stratosphere airplane was made at the Toussus-le-Nobel airport near here recently.

Foreign Exports Show Decline As World Slump Fails to Ease

WASHINGTON, Sept. 1—A continuation of the unsettled conditions existing in the world markets throughout the first six months of the present year was reflected in a further decline of our foreign trade in automotive products, the total value being \$49,083,697, or 52 per cent (\$53,186,415) below the figure established during the corresponding period of 1931, according to the Department of Commerce.

Exports of passenger cars (25,789) and trucks (12,260) were 52 and 57 per cent, respectively, under the unit shipments of January-June, 1931, while production declined 44 per cent

in each group. Values of passenger cars and trucks shipped abroad were reduced by 50 and 63 per cent, respectively, and the total for miscellaneous products (\$28,032,104) was 47 per cent lower than in the first half of last year.

The monthly average of export values for the first half of the past five years is as follows: 1928, \$43,322,447; 1929, \$58,738,949; 1930, \$32,671,260; 1931, \$17,045,018, and 1932, \$8,180,616.

Total automotive imports dropped from \$608,405 to \$208,915, a decline of \$399,490, or 65 per cent, from the first six months of 1931.

Automotive Exports From the United States

Classification

	January-June, 1931			
Number	Value	Number	Value	
Passenger cars and chassis	53,552	\$33,148,282	25,789	\$15,306,093
Motor trucks, buses and chassis	28,988	15,665,087	12,260	5,745,500
Second-hand passenger cars	1,287	537,593	414	163,455
Second-hand trucks and buses	180	72,931	73	54,672
Automobile engines	16,872	1,677,248	16,339	1,402,081
Parts for assembly		25,715,906	....	13,168,168
Parts for replacement		14,736,187	....	6,950,642

In but two instances—passenger car engines and molded and semimolded brake lining—did our shipments of automobile products show an increased valuation over the January-June period of last year. All other items were generally reduced, with the exception of hand and electric horns, which had a higher total in number but a lower value.

Belgium remained the chief market for passenger cars, but dropped to second position in the truck list, being supplanted by Japan which also took the position of our leading purchaser of motor cycles. It should be remem-

bered that a large share of the passenger cars and trucks going to Belgium are intended for reexport.

The Philippine Islands occupied the position of fifth important market for passenger cars, coming up from thirteenth place in 1931. Australia took seventh place, with 1,130 units valued at \$352,721, as against 472 units valued at \$123,676 for the first half of 1931.

Truck markets were all reduced. For motor cycles, Japan showed the only improvement as a market, advancing from third place which it occupied during the like period of 1931.

Leading Export Markets for American Motor Vehicles, January-June, 1932

Country of Destination	Number	Value
Passenger Cars		
Belgium	5,061	\$2,708,998
Union of South Africa	2,164	1,226,849
Japan	2,098	1,186,676
Argentina	1,604	723,376
Philippine Islands	1,222	763,650
Netherlands	1,156	796,972
Australia	1,130	352,721
Sweden	1,049	502,210
Switzerland	1,047	804,590
Canada	875	598,380
Other countries	8,383	5,641,371
Total	25,789	\$15,306,093
Trucks, Buses and Chassis		
Japan	2,207	742,922
Belgium	1,877	686,549
Spain	899	461,876
Philippine Islands	774	379,710
British India	664	244,251
China	465	242,631
Sweden	445	136,858

Country of Destination	Number	Value
Trucks, Buses and Chassis—Cont.		
Brazil	323	\$149,725
Netherlands	308	193,640
Cuba	289	143,534
Other countries	4,009	2,363,804
Total	12,260	\$5,745,500

Country	Number	Value
Motor Cycles		
Japan	487	117,702
Canada	205	50,476
Netherlands	192	26,659
Germany	79	17,501
Switzerland	63	13,805
Kwantung	47	12,461
Mexico	29	7,092
Belgium	29	6,636
Italy	22	4,735
Union of South Africa	18	4,076
Other countries	145	32,523
Total	1,316	\$293,666

Hayes Body Reports June Quarter Loss

DETROIT, Aug. 30—Hayes Body Corp. reports for quarter ended June 30, 1932, net loss of \$82,730 after depreciation, interest, etc., comparing

with net loss of \$100,597 in preceding quarter and net loss of \$70,597 in June quarter of previous year.

For six months ended June 30, 1932, net loss was \$183,327 after charges against net loss of \$163,436 in first half of 1931.

September 3, 1932

Willys Betters Sales Position

July New Car Sales Show Gain as Company Rises to Sixth Place

TOLEDO, Aug. 30—New car registrations from the first 22 states reporting for July show Willys-Overland in sixth place in the entire automobile industry, H. B. Harper, vice-president in charge of sales, announced here.

According to additional information received from the field, Willys-Overland stands in fourth position in a number of important points throughout the country. In production, Mr. Harper said, Willys-Overland was in fifth place in July, climbing from eighth place in June.

Complete July registrations from the three largest communities of southern California place Willys-Overland in fourth position with sales almost 300 per cent over May, which is ordinarily a peak month.

In Hamilton County (Cincinnati), Willys-Overland registrations were fourth; in Erie County (Buffalo), also fourth.

P. C. Gartley, Chicago distributor for Willys-Overland products, reports that registrations for the first 22 days of August place the Toledo manufacturer in fourth position with 4.8 per cent of the total sales in Cook County.

Memphis Sales Reported Good

MEMPHIS, TENN., Aug. 30—Automobile dealers here report a fine improvement in August trade over July. Equal confidence prevails that autumn will bring the usual prosperous conditions in this metropolis.

The Tri-States have very good crops. Fine rains have come in August. Industrial operation except lumber plants is much more active.

Paint shops, automotive repair shops and tire places report better business. The new models in high-price cars are moving well, but the most notable improvement is in medium and low-price cars of late design, including commercial types.

The Ford open-air salon at Ford Motor Co. plant, staged for a week in August, 10 a.m. to 10 p.m., attracted large crowds, and tests were given the visitors on passenger and commercial cars.

Ogan Named Chase Manager

NEW YORK, Aug. 31—George B. Ogan, for 17 years manager of the Chicago office of L. C. Chase & Co., textile firm, has been appointed general manager of the entire Chase organization, with headquarters here.

Automotive Industries

Exports, Imports and Reimports of the Automotive Industry For July and Seven Months Ended July, 1932-1931

	Month of July		1931		1932		Seven Months Ended July		1931	
	Number	Value	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, parts and accessories .....	.....	\$6,162,062	.....	\$11,722,509	.....	\$51,819,162	.....	\$105,421,174	.....	\$105,421,174
Motor trucks, buses and chassis (total)	1,865	897,735	3,518	1,962,371	14,196	6,637,305	32,688	17,703,319	5,111	1,814,647
Under one ton	160	43,213	320	110,284	1,506	396,460	23,532	10,575,707	1,218	1,218
One and up to 1½ tons	1,532	616,234	2,658	1,132,207	10,909	4,328,930	2,747	3,259,970	995,930	995,930
Over 1½ tons to 2½ tons	130	113,096	422	564,467	466	858,973	1,019	1,856,705	1218	1218
Over 2½ tons	35	122,852	86	134,485	466	858,973	1,019	1,856,705	86	86
PASSENGER CARS										
Passenger cars and chassis	3,039	1,631,914	6,478	4,075,987	29,242	17,101,466	61,316	37,761,377	.....	.....
Low price range, \$850 inclusive	2,682	1,275,348	5,256	2,627,599	24,648	11,810,185	49,601	23,434,033	.....	.....
Medium price range, over \$850 to \$1,200	185	161,834	722	705,326	2,636	2,515,300	7,988	7,663,877	.....	.....
\$1,200 to \$2,000	82	109,089	227	335,618	981	1,291,257	2,145	3,103,477	.....	.....
Over \$2,000	22	58,131	141	355,908	495	1,293,753	1,166	2,971,521	.....	.....
PARTS, ETC.										
Parts except engines and tires .....	.....	1,938,136	.....	2,957,752	.....	15,106,304	.....	28,673,658	.....	.....
Automobile unit assemblies .....	.....	1,096,462	.....	2,172,580	.....	8,047,104	.....	16,908,767	.....	.....
Automobile accessories .....	.....	98,824	.....	169,304	.....	975,891	.....	2,244,747	.....	.....
Automobile service appliances (n.e.s.) .....	.....	98,231	.....	281,162	.....	1,046,183	.....	2,544,981	.....	.....
Trailers	69	79,715	34	17,716	177	138,169	525	176,927	.....	.....
Airplanes, seaplanes, and other aircraft	5	52,000	15	191,586	66	649,959	83	1,102,745	.....	.....
Parts of airplanes, except engines and tires .....	.....	87,131	.....	154,684	.....	568,332	.....	1,137,459	.....	.....
BICYCLES, ETC.										
Bicycles	20	454	75	2,026	526	12,716	1,037	26,981	.....	.....
Motorcycles	146	29,677	501	111,238	1,462	323,343	4,344	1,049,895	.....	.....
Parts and accessories, except tires .....	.....	20,398	.....	57,341	.....	207,358	.....	387,665	.....	.....
INTERNAL COMBUSTION ENGINES										
Stationary and Portable .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Diesel and Semi-Diesel	2	2,753	6	27,160	25	126,898	52	168,444	.....	.....
Other stationary and portable:	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Not over 10 hp.	292	15,359	715	56,451	2,446	158,796	5,571	435,015	.....	.....
Over 10 hp.	61	29,856	247	104,674	436	239,068	3,528	1,671,983	.....	.....
Automobile engines for:	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Motor trucks and buses	50	20,243	43	20,776	1,507	239,309	4,027	618,179	.....	.....
Passenger cars	1,305	78,582	1,584	90,307	16,187	1,261,597	14,436	1,170,152	.....	.....
Tractors	2	723	11	1,139	10	17,099	20	4,742	.....	.....
Aircraft	222	150,480	52	144,156	852	541,340	207	1,004,892	.....	.....
Accessories and parts (carburetors) .....	.....	94,762	.....	167,859	.....	776,598	.....	1,369,912	.....	.....
IMPORTS										
Automobile and chassis (dutiable)	35	16,448	64	49,858	258	162,172	381	433,093	.....	.....
Other vehicles and parts for them (dutiable) .....	.....	2,789	.....	7,392	.....	27,708	.....	36,610	.....	.....
REIMPORTS										
Automobiles (free from duty)	2	350	48	22,580	82	83,574	133	96,207	.....	.....

North Carolina Bans Georgia Reciprocity

RALEIGH, N. C., Aug. 30.—The North Carolina Highway Commission, following unsuccessful efforts to effect a workable reciprocity agreement with Georgia, has served notice that after Sept. 1 all motor vehicles registered and licensed in Georgia and operated for hire must pay the road license tax and register in this state before being permitted to use its highways.

The notice, it was stated, applies to trucks and automobiles operated for hire. It does not affect passenger cars in ordinary use.

In the past North Carolina has extended courtesy to Georgia trucks operating in North Carolina, and anticipated the same treatment. However, Georgia police and judges of late have dealt exceedingly stern with operators of trucks for hire from North Carolina.

Tropic-Aire Upheld In Heater Patents

MINNEAPOLIS, Sept. 1.—Officers of Tropic-Aire, Inc., corporation manufacturing automobile accessories, announced that the company had won a legal fight over a patent on its automobile heaters.

The decision was returned in Fed-

eral District Court for the Eastern District of New York and upheld the Tropic-Aire-Caesar patent on automobile heaters.

Edmund A. Burke, general manager of Tropic-Aire, said the court had ruled the patent had been infringed by E. A. Wildermuth of Brooklyn. The Wildermuth Co., Burke said, is distributor for the United States Corp., a subsidiary of General Motors Corp.

Orville S. Caesar, formerly of Superior, Wis., is credited with inventing the heater.

Arthur J. Hayes

Arthur J. Hayes, managing director of the Champion Spark Plug Co. of Canada, Ltd., Windsor, Ont., passed away in the Ottawa General Hospital recently. Mr. Hayes, who was in the Canadian capital on business, was apparently in excellent health until a few hours before he was stricken with a heart attack. He was 49 years of age and was born in Cleveland, Ohio. The deceased was in charge of the Champion Co.'s Canadian business for the past 15 years and was a widely known executive in the automotive field on both sides of the border. Mr. Hayes was a director of the Windsor Rotary Club, a member of the Knights of Columbus and director of the Automotive Boosters Club of Canada.

Huge Non-Rigid Dirigible Ready for Trials Soon

Oct. 15 Set for Trials of 233-ft. Army Craft

AKRON, Aug. 29.—The TC-13, world's largest non-rigid airship, now being built for the United States Army by Goodyear Tire & Rubber Co., will be ready for trial flights Oct. 15, it was announced here today. The new ship will be 233 ft. long with a gas capacity of 360,000 cu. ft.

Work on the U.S.S. Macon, giant dirigible and sister ship of the Akron, now being built by Goodyear for the U. S. Navy, has been slowed up to delay completion date to the early spring, Goodyear officials say. Earlier plans approved by Congress recently called for completion of the Macon by Jan. 1.

Failure of the Senate to act on the merchant airship bill, killing immediate hopes of commercial airship construction by Goodyear-Zeppelin Corporation, is given as the reason for the delay in completion of the Macon, it is understood.

Goodyear is endeavoring to hold its nucleus airship construction organization together as long as possible with the hope the company may yet be able to start work on commercial airships, officials indicate.

British Bus Travel Harasses Railroads

Poor Earnings Reflect Increased Motor Transport

LONDON (*special*)—Despite economies, pursuit of which is spurred by necessity, the four big railroad systems of Great Britain report gross earnings in the first half of 1932 almost £7,000,000 less than for the corresponding half of 1931. In all of 1931 these earnings fell £15,000,000 below the relatively poor ones of 1930.

The depression accounts for much of the railroads' tribulations, but motor vehicles have become acute competition for steam lines.

There were only 1888 motor-transport operating undertakings in 1921-22; 10 years later the number was 7759, of which 5649 in the form of private enterprises, 1936 in that of companies, and 174 under control of municipalities.

Some 1500 private and company undertakings alone represent today £73,000,000 of invested capital against £20,000,000 10 years ago, and 106 companies with capital of £36,000,000, paid an average ordinary dividend of more than 8½ per cent on 1931 operations.

Thomas Tilling, Ltd., by far the biggest operator of road transport, paid 20 per cent on ordinary shares for 1931.

Buses run along all the first-class and most of the second-class roads according to regular schedules, and both classes of roads together number over 18,000 miles.

The man who travels for business or pleasure considers as a matter of course whether he shall go by rail or road, and if he is not pressed for time and wants to save a little money, he will choose the road.

Railroads have been forced to compete by offering special excursion rates for round trips, but they are slowly perceiving that the new competitor is bound to revolutionize the transport situation sooner or later, and that cooperation is better than competition.

Drying Systems, Ltd., Canadian Subsidiary

Drying Systems, Ltd., Ottawa, Ont., has been incorporated to act as associates in handling all of the business which Drying Systems formerly has been handling in Canada. The officers of the company are: W. Mavor, president; C. H. Currier, vice-president; E. A. McDonald, secretary-treasurer; R. A. Weaver and C. K. C. Martin, directors.

Cincinnati Gets Automotive Plant

CINCINNATI, Aug. 30—The internal engine parts division of the Aluminum Industries, Inc., is to be moved here,

it was announced as a lease was arranged for the plant formerly occupied by the C. R. Breuer Smelting & Refining Co.

The internal engine parts branch is to have available floor space of 40,000 sq. ft., of which the plant just leased will provide 15,000 sq. ft. The division formerly was located at St. Cloud, Minn., and according to Harry J. Hater, general manager, the St. Cloud plant is not to be abandoned because of the transfer.

Pennsylvania Rubber Boosts Tire Prices

AKRON, Aug. 28—W. O. Rutherford, president of the Pennsylvania Rubber Co., challenging the rubber industry with the statement that it had "been selling America short" for the past three years, has announced that his company would make a 12 per cent increase in tire prices within a short time.

Rutherford's pronouncement again brought to the fore the previously unsuccessful attempt to pass on the Federal tax. Rutherford, who formerly was vice-president of the B. F. Goodrich Co., stated that, "I propose the industry yield to public sentiment and place the business on a profitable basis now. This we can help do by including the Federal tax and eliminating harmful practices."

His statement asked leaders to unite on the proposed price increase for balancing the tax.

White Motor Co. Net Loss \$1,427,707

Six Months' Results Compare With \$1,004,910 1931 Period

CLEVELAND, Sept. 1—White Motor Co. and subsidiaries report for six months ended June 30, 1932, net loss of \$1,427,707 after depreciation, taxes, inventory adjustment and after consolidation of earnings of White Motor Securities Corp. and White Motor Realty Co. This compares with net loss of \$1,004,910 in the first six months of 1931.

Consolidated income account of White Motor Co. and subsidiaries for six months ended June 30, 1932:

	1932	1931
Sales	\$9,843,534	\$13,059,849
Net loss	1,427,707	1,004,910
Dividends	354,750	
Deficit	\$1,427,707	\$1,359,660
Surp. Dec. 31....	7,979,238	6,991,081
P. & L. Surplus..	\$6,551,531	\$5,631,421

Crown Seal Reports

DETROIT, Aug. 29—Net sales of the Crown Seal & Cork Co., which owns the Detroit Gasket & Mfg. Co., and its subsidiaries for the six months ended June 30, 1932, amounted to \$3,971,329, as compared with \$4,716,476 for the same period in 1931.

After all charges, depreciation, interest, taxes and dividends, there remained a deficit of \$197,898 for the six-month period this year.

++ CALENDAR OF COMING EVENTS ++

FOREIGN SHOWS

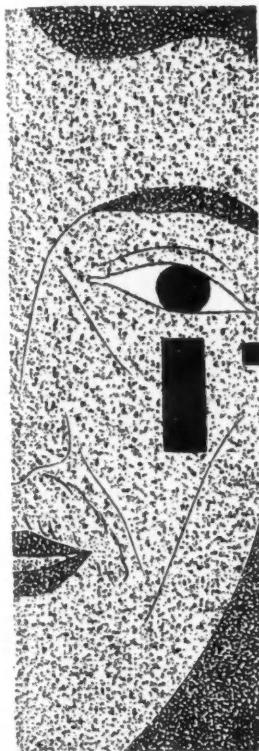
London, Olympia Show Oct. 13-22
Glasgow, Scottish Motor Show... Nov. 11-19
Paris, Aeronautical Show... Nov. 18-Dec. 4

CONVENTIONS

American Society Mechanical Engineers, Cleveland, Ohio (Machine shop practice meeting)	Sept. 12-17	National Safety Council, Washington, D. C.	Oct. 3-7
American Trade Association Executives, Atlantic City (Annual)	Sept. 15-17	American Welding Society, Buffalo, N. Y.	Oct. 3-7
Penna. Automotive Assn., Harrisburg, Pa.	Sept. 19-20	American Society Mechanical Engineers, Buffalo, N. Y. (Natl. Iron and Steel Meeting).....	Oct. 3
Natl. Assoc. of Motor Bus Operators, Chicago	Sept. 29-30	S. A. E. Annual Transportation Meeting, Toronto	Oct. 4-6
American Electric Railway Assn., Chicago, Ill.	Sept. 27-28	American Gas Association, Atlantic City (Annual)	Oct. 10-14
Amer. Institute Mining & Met. Engrs. (Petroleum Division), Dallas, Texas	Sept. 30-Oct. 1	Natl. Hardware Assn. (Accessories Branch), Atlantic City, N. J.	Oct. 17-22
National Metals Congress, Buffalo	Oct. 3-8	Natl. Tire Dealers Assoc., Atlanta, Ga.	Nov. 14-16
S.A.E. Production Meeting, Buffalo	Oct. 3	American Society Mechanical Engineers, New York City (Annual Meeting)	Dec. 5-9
Amer. Society for Steel Treating, Buffalo	October 3	Natl. Exposition of Power & Mechanical Engineering, New York	Dec. 5-10
Amer. Institute Mining & Met. Engrs. (Iron & Steel Division), Buffalo, N. Y.	Oct. 3-6	Highway & Building Congress, Detroit	Jan. 16-23

RACES

National Air Races, Cleveland	Aug. 27-Sept. 5
Altoona	Sept. 5



f

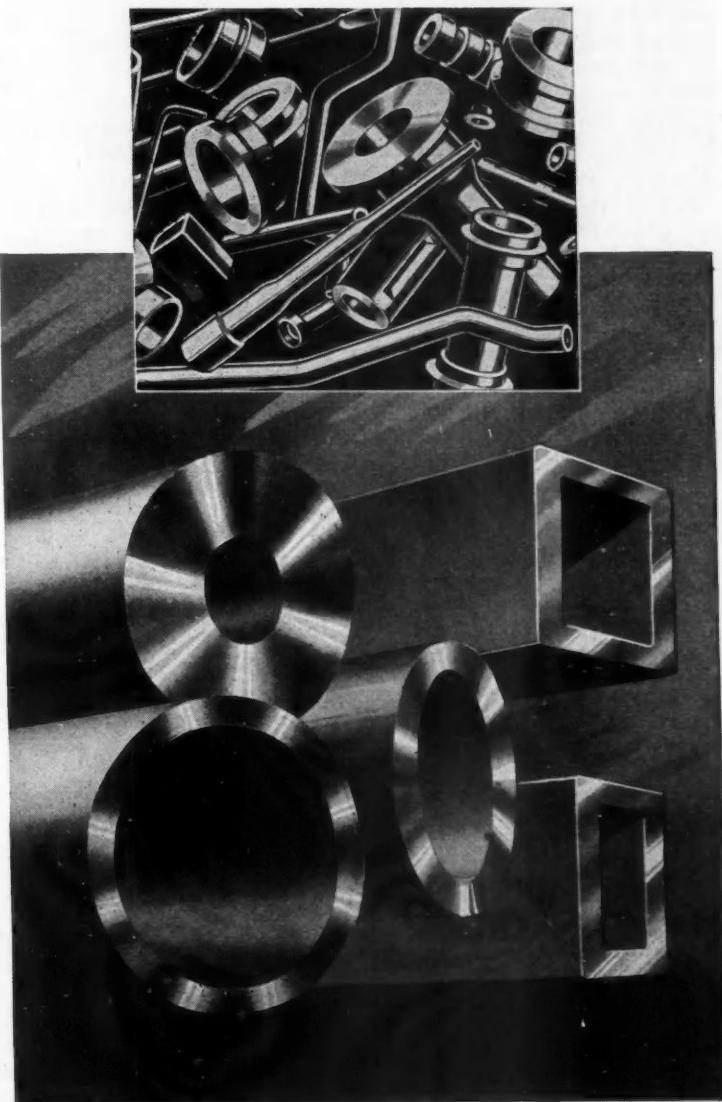
*you are keeping an
EYE ON "PARTS" COSTS*

Keep this in mind. The most economical method for making "parts" is to use seamless tubing. Sometimes just a single cut or light grinding may be all that is needed to adapt tubing to your purpose. And you don't have to worry about shapes, sizes, and wall-thicknesses of NATIONAL-SHELBY Tubing. There's a full range available, together with different grades and anneals of steel to offer numerous possibilities that you may have never considered. Perhaps you will find this product applicable to some purpose for which you now use solid stock. If so, it is sure to be more economical in the long run.

If you are keeping an eye on "Parts Costs"—better look into the possibilities of Seamless Tubing. In the meantime, send for handbook—"Seamless Tube Standards"—giving data on NATIONAL-SHELBY—

America's Preferred Seamless Tubing

NATIONAL TUBE COMPANY, Pittsburgh, Pa.
Subsidiary of United States Steel Corporation



NATIONAL-SHELBY SEAMLESS TUBING

Automotive Industries

September 3, 1932

Citroen Heat Treatments Limited by Extensive Standardization Plan

(Continued from page 292)

from other bars, blooms, etc., after elimination of the bars, blooms, etc., shown to be defective in the first test. If all of the results of the checking test are satisfactory, the lot will be accepted. If a single result is unsatisfactory, the lot will be rejected.

Now for a rough comparison with the S.A.E. standards noted in table 1. Grades C1, C3, K8, H7 and E0, check very closely. But K9 and L8 are absolutely special and do not approximate any S.A.E. standard. The other seven grades listed conform in some respects although there are several evident variations.

For instance, H3 and H4 are low in chromium for the corresponding S.A.E. grade. X2 and C6 vary mainly in manganese content, while K6 conforms closely except for its much lower nickel content. The chief variation in grades H0 and H1 is that both carbon and manganese are given as single values, max. in each case, falling at about the mean value in the S.A.E. specification.

Since heat-treatment is a critical process and must be adapted to the specific needs of the finished part, we have picked out the more general instructions just for purposes of comparison. Formal procedure is shown in table 3; the key to each specification is given below:

- A. Annealing of parts in C3, X2, H1, H4, H7 and H0.
- A1. Annealing of parts of C1 steel.
- A2. Annealing of parts of gray cast iron.
- A3. Annealing of parts of aluminum.
- B. Quench in water followed by a draw.
- C. Quench in water followed by a draw.
- D. Quench in oil followed by a draw at low temperature.
- E. Quench in oil followed by a draw at a moderate temperature.
- F. Quench in air followed by a draw at low temperature.
- G. Carburization followed by treatment T1 for refining and T2 for case hardening, possibly preceded by A1.
- H. Quench in oil or in water followed by a draw at low temperature.

L. Normalizing quench followed by a strengthening quench.

M. Normalizing quench followed by anneal.

It is the practice at Citroen to indicate on the working drawing a key letter showing the required thickness of case. The key letters and values given below serve as instructions to the heat-treating department and thus control the duration of the carburization cycle.

Table of Depths of Carburization

Class	Thickness of Case, in.	Thickness allowed for Grinding, in.	Total Thickness, in.
a	0.012	0.008	0.020
b	0.020	0.008	0.028
c	0.032	0.008	0.040
d	0.040	0.012	0.052

By the same token the following tabulation shows the specified scleroscope hardness of a number of typical parts.

Camshaft	.....	above 75
Piston pin	.....	70
Coupling-bar shaft	.....	70
Cam-gear pinion shaft	.....	70
Spring bolt	.....	70
Planetary pinion shaft	.....	70
Planetary gear	.....	70
Spiral bevel drive gear	.....	70
Universal joint center	.....	70
Planetary pinion	.....	70
Steering-knuckle spindles	.....	70
Steering joint	.....	70
Steering sector	.....	70
Valve tappet	.....	70
Crankshaft	.....	60
Steering worm	.....	70
Primary shaft	.....	60
Reverse gear shaft	.....	65
Steering stop screw	.....	65

In retrospect, the foregoing discussion of the metallurgical practice of one of the foremost car makers in Europe not only is a valuable contribution to our literature but indicates a spirit of international co-operation matching the cooperation between American manufacturers as fostered by the S.A.E.

Symposium on Rubber

Symposium on Rubber. Published by the American Society for Testing Materials, 1317 Spruce Street, Philadelphia, Pa.

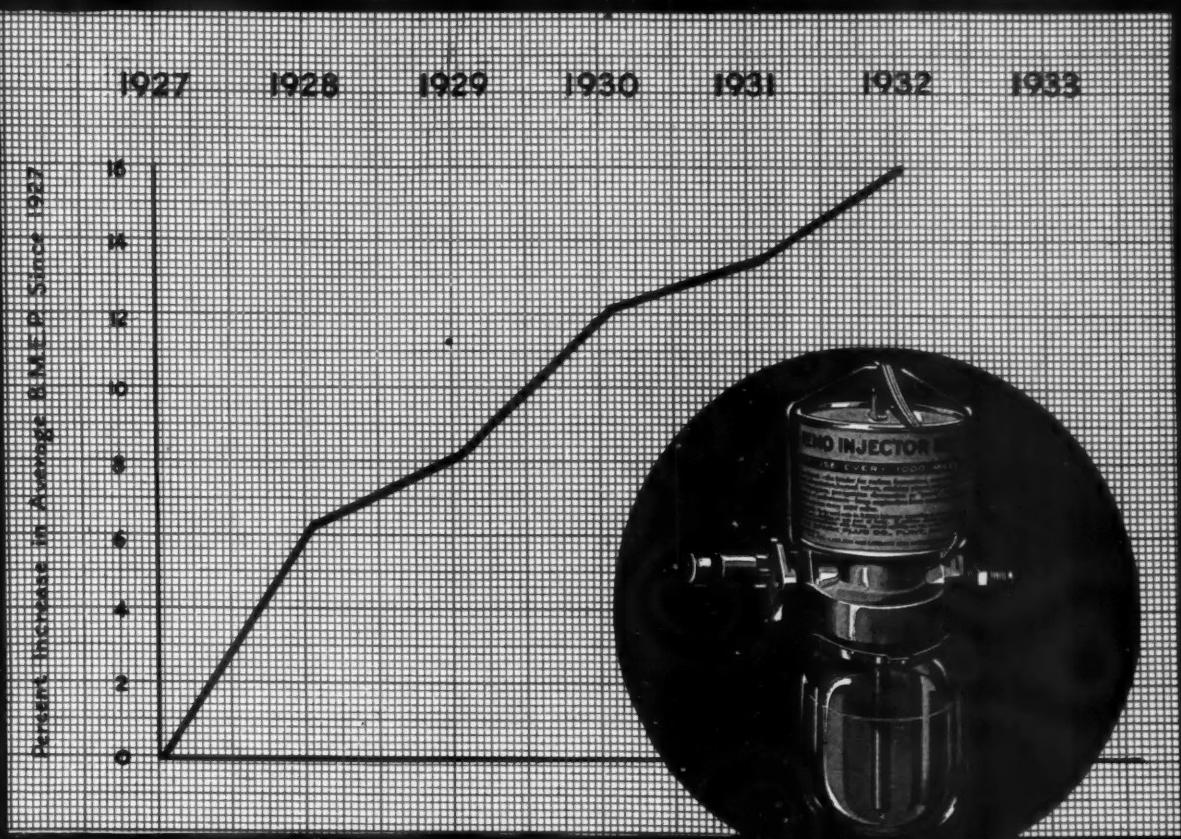
AT a Cleveland regional meeting in March last, the American Society for Testing Materials held a symposium on the subject of rubber which covered both the manufacture of rubber products and the properties of rubber as an engineering material. Five papers were contributed under the former and seven under the latter heading, and these, together with the discussions on them, are combined in this 160-page book.

The first group of papers deals with the extent and diversity of the industry, crude and reclaimed rubber,

vulcanization, compounding (fillers, reinforcing agents, softeners), and the structures of rubber in combination with textiles and other materials.

The second group includes papers on the flexing of rubber products, shock and vibration properties, deterioration of rubber due to friction, chemical resistance, resistance to water and gases, the electrical characteristics of rubber insulation and rubber as an adhesive.

Valuable data are given in the papers in the form of tables and charts, and the symposium papers are well illustrated throughout. A coated paper stock having a rubber latex content is appropriate and brings out clearly the details in the illustrations.



How High Can Brake Mean Effective Pressures be Raised?

THE average brake mean-effective-pressure of American passenger automobile engines today is about 16 per cent greater than it was in 1927. The average engine, in consequence, is decidedly more powerful and efficient today. And there is no indication that development in this direction has reached its limit.

Compression ratios are being increased steadily as engineers strive to build more and more power into their cars without increasing the weight of the engine. In increasing the compression ratios, however, designers have had to stop somewhat short of the ratios allowable for new engines, so that the combustion chamber deposits, which inevitably form in service, will not cause unsatisfactory operation of the engine after a few thousand miles of driving. Even in lower-compression engines, combustion chamber deposits always cause loss of power—and in high-compression engines they may cause sufficient pre-ignition and overheating to render the operation entirely unsatisfactory.

Years ago, a group of scientists foresaw this situation. They realized that engine deposits stood in the way of the ultimate development of the high compression engine, and they set out to devise an inexpensive and simple means of removing these harmful deposits from the engine. They found that certain



FOR BETTER ENGINE PERFORMANCE

sticky gummy substances, formed during the combustion of gasoline and lubricating oil, were the primary cause of combustion chamber deposits. Adhering to the various exposed surfaces and to small particles of carbon and road dust, they build up the characteristic "carbon formations" which are found in all automobile engines after relatively short periods of service.

REMO was developed to dissolve these gummy substances and thus loosen and remove these deposits which so greatly impair the operation of high-compression engines.

A treatment with REMO every 1000 miles keeps an engine clean throughout its life. The gummy binder is dissolved and the deposits are carried out of the engine by the exhaust gases. Engines equipped with REMO do not have to be designed for a compression lower than that satisfactory for new engines, because there is no need to compensate for combustion chamber deposits when REMO makes it so simple and economical to remove them.

REMO also removes the gums from valve stems and piston rings and thus insures the proper operation of these parts. Any engine can be REMO equipped at surprisingly small cost. An AC engineer will be glad to bring you all the facts.

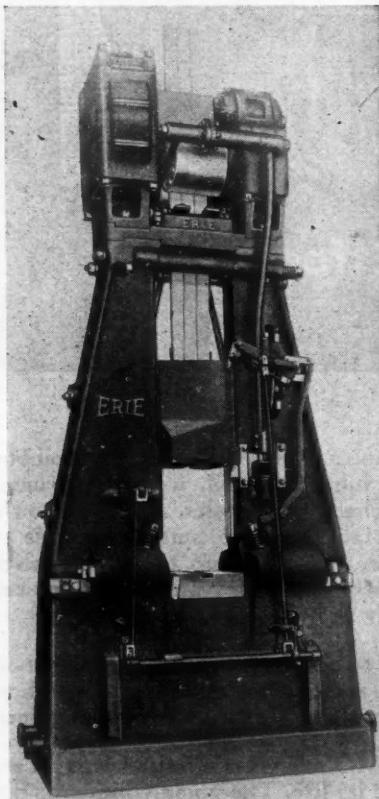
AC SPARK PLUG COMPANY
Flint, Michigan St. Catharines, Ontario

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Erie Board Drop Hammer

A long-standing handicap of the board drop hammer has been overcome by the variable stroke board drop hammer being marketed by the Erie Foundry Co., Erie, Pa. In this design, the length of the stroke is not adjusted in the conventional manner. Instead, the operator has available either a light or heavy blow, a short or a long stroke, and can choose either at will. The



Type M, Erie variable stroke board drop hammer

hammer is treadled in the usual manner with one foot, and the length of the stroke is governed by a very slight rocking of the foot on the treadle. The photograph shows the variable stroke construction applied to an Erie type "M" motor-driven board drop hammer. The construction is simple and costs only slightly more than the ordinary design. It can, moreover, be applied to existing hammers at very moderate expense.

September 3, 1932

Parker-Kalon New Forged Wing Nuts

Parker-Kalon Corp., New York, has developed a complete line of cold-forged wing nuts. These nuts are produced by a new high-speed automatic process developed in the manufacture of precision screw products. They are claimed to be free from flaws, roughness and other imperfections common to stamped, pressed steel, cast iron and malleable iron nuts; neater,

stronger and better finished.

The wings of the nuts are uniform and so shaped as to provide ample finger grip for drawing them up tight and to facilitate removal. They have no sharp corners or rough edges that may cause injury.

The holes are centrally located and accurately punched, which assures a clean-cut, uniform thread. The base of the wing nut has no thread burrs and is square with the top so that it will draw up tight and flush with the work.

On Labor

Folks interested in personnel work will find some valuable reference material in a bulletin just published by the U. S. Dept. of Labor. Its title explains its contents, "Chronological Development of Labor Legislation for Women in the United States." U. S. Dept. of Labor, Bulletin of the Women's Bureau, No. 66-11. Looks to us like a worthwhile handbook.

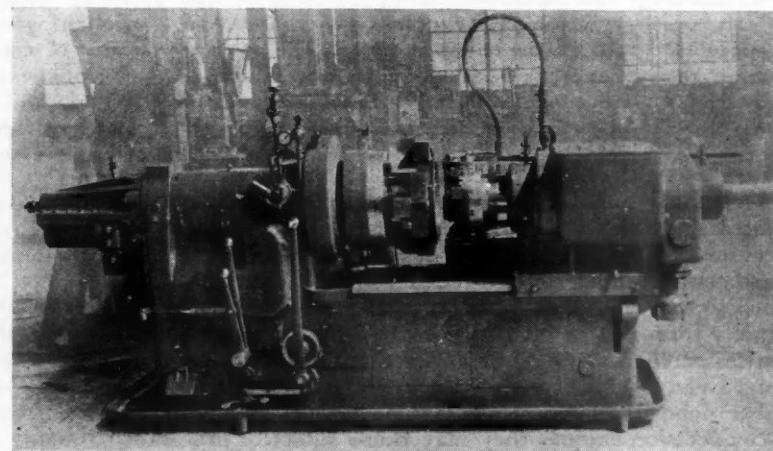
New Equipment For Machining Brake Drums

Radical departures from customary brake drum machining practice are embodied in this unit machine built by Gisholt Machine Co., Madison, Wis., for roughing out a front wheel hub and brake drum consisting of a single malleable iron casting.

Replacing the standard Simplimatic traversing platen table is a fixed tailstock housing. This housing carries a boring spindle actuated by a large diameter continuous cylindrical cam and the necessary gearing to complete the feed mechanism.

twelve tools for roughing out the 14 in. x $3\frac{3}{16}$ in. braking surface and six tools for the inside tapered roller bearing seat in the hub. The back boring attachment carries a six cutter boring head for the outside tapered roller bearing. The rear slide, mounted at a 45 deg. angle with the axis of the work, carries tools for chamfering the bore, facing and turning the outside diameter. There is a total of twenty-seven cutting tools and blades feeding in four different directions.

The use of cemented carbide tools permitting higher cutting speeds and multiple cutter boring heads permitting heavier feeds helps the machine to turn out these drums in a minute



In place of the customary air chucking equipment, is a wrenchless chuck operated by an air cylinder mounted on the rear side of the machine. This leaves the bore of the work spindle clear for the addition of a back boring attachment.

When the machine is started, all tools traverse rapidly to their starting positions. The boring head carries

and a quarter each floor to floor.

The second operation of facing the wheel seat and finish boring the bearing seats; and the third operation of finish single-point boring the braking surface concentric with the tapered roller bearing cups are performed in 1 $\frac{1}{4}$ min. and 2 $\frac{1}{2}$ min. respectively in Gisholt Simplimatics of a more standard nature.

Automotive Industries